This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

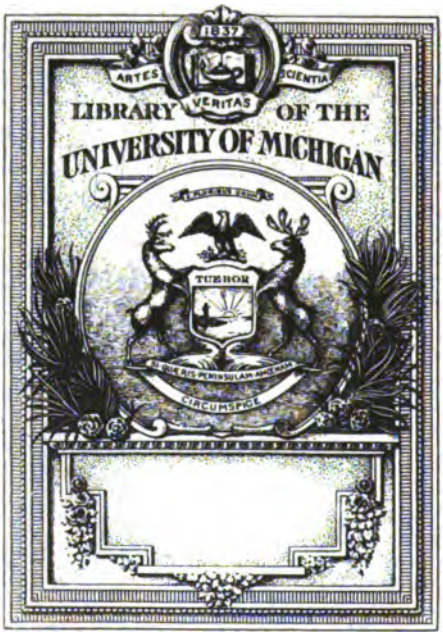
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

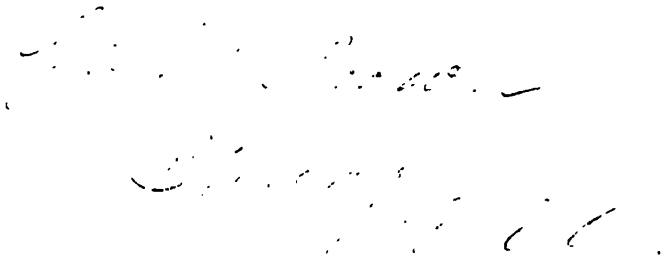
About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`



THE GIFT OF
Prof. J. S. Worley

SD
11
A4



DEPARTMENT OF AGRICULTURE.

REPORT

ON

FORESTRY.

PREPARED BY

NATHANIEL H. EGLESTON.

VOLUME IV—1884.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1884.

5893 FOR

CONTENTS.

I. INTRODUCTORY REMARKS.

II. SIX REPORTS FROM THE PRAIRIE STATES ON TREE-PLANTING.

III. CONCLUSIONS DRAWN FROM THE RETURNS OF THE PRAIRIE STATES RESPECTING THE COLLECTION, PRESERVATION, AND PLANTING OF SEEDS OR YOUNG TREES.

IV. REPORT OF MR. F. P. BAKER, AGENT OF THE DEPARTMENT, REGARDING THE CONDITION OF FORESTS, TIMBER-CULTURE, ETC., IN THE SOUTHERN AND WESTERN STATES.

V. REPORT OF MR. F. B. HOUGH, AGENT OF THE DEPARTMENT, ON THE KINDS AND QUANTITY OF TIMBER USED FOR RAILROAD TIES.

VI. REPORT OF MR. F. B. HOUGH, AGENT OF THE DEPARTMENT, ON THE DECREASE OF WOODLANDS IN THE STATE OF OHIO, FOR THE PERIOD OF TWENTY-EIGHT YEARS, WITH ILLUSTRATIVE CHARTS.

VII. REPORT OF MR. F. P. BAKER, AGENT OF THE DEPARTMENT, ON THE FOREST CONDITION OF CERTAIN STATES.

VIII. REPORT OF MR. F. P. BAKER, AGENT OF THE DEPARTMENT, UPON THE LUMBER AND WOOD TRADE IN CERTAIN STATES.

IX. REPORT OF MR. R. W. FURNAS, AGENT OF THE DEPARTMENT, ON THE FOREST CONDITION, AND LUMBER AND WOOD TRADE OF WESTERN STATES AND TERRITORIES.

X. REPORT OF MR. R. W. FURNAS, AGENT OF THE DEPARTMENT, ON TREE-GROWTH, AGE, PERIOD OF DECLINE, COMPLETION OF CYCLE, ETC.

XI. SPECIAL REPORT OF MR. R. W. FURNAS, AGENT OF THE DEPARTMENT, ON FORESTRY IN CERTAIN PORTIONS OF INDIANA AND OHIO.

XII. REPORT OF MR. F. B. HOUGH, AGENT OF THE DEPARTMENT, ON THE FOREST CONDITION, LUMBER, AND WOOD TRADE OF NEW HAMPSHIRE AND WEST VIRGINIA.

XIII. REPORT OF MR. J. P. BROWN, AGENT OF THE DEPARTMENT, ON THE FORESTS OF WASHINGTON TERRITORY.

XIV. REPORT OF MR. F. B. HOUGH, AGENT OF THE DEPARTMENT, ON THE PRODUCTION OF MAPLE SUGAR IN THE UNITED STATES AND CANADA, WITH ILLUSTRATIVE CHARTS.

Rec'd. J. L. Morley
Gift
12-6-1927

REPORT UPON FORESTRY.

INTRODUCTORY.

The Department of Agriculture, in pursuing its investigations of the subject of forestry, and in view of the special needs of the so-called "Prairie States," on account of the scarcity of trees by which they are distinguished, during the winter of 1882-'83 distributed widely throughout those States and the Territory of Dakota the following circular:

DEPARTMENT OF AGRICULTURE.

INQUIRIES CONCERNING FOREST-TREE PLANTING.—B.

To ——— ———:

SIR: The Department of Agriculture, having under investigation the subject of forestry, desires to collect and summarize the experience of those who have been engaged in planting, with the view of ascertaining the success or failure that has attended the cultivation of particular species, and the methods of planting and management that have been found most profitable.

You are respectfully requested to fill out and return this blank, at your earliest convenience, giving the results of your own observation and experience in the particulars indicated by the following inquiries.

Respectfully, yours,

GEO. B. LORING,
Commissioner of Agriculture.

1. Township to which this blank refers, ———; county, ———; State or Territory, ———.

2. Mention, as near as may be in the order of preference, the kinds of trees that have been found to grow successfully, as follows:

Kinds.	Remarks.	Kinds.	Remarks.

(Under the head of "Remarks" may be mentioned any particular facts that may have been noticed as to spring or fall planting or sowing, the situations most favorable for growth, or other facts of interest. If there are any trees the names of which are unknown or uncertain, by sending speciments of the leaves, seeds, or fruit, they may be readily ascertained.)

3. Kinds of trees that have been tried, and that have *not* proved successful:

Kinds.	Remarks.

4. What injuries have been noticed to occur from insects or other causes?

5. What other difficulties have been noticed in attempts at tree-planting?

6. *General remarks.*—Upon the collection and preservation of seeds or young plants—their planting and management; the kinds that promise to be the most profitable for cultivation; the preparation of the soil; intervals between trees; and other subjects of interest.

From the large number of replies received, the following summaries and condensed reports, arranged by States and counties, have been compiled. The endeavor has been made to indicate the value of the statements given in connection with each subject embraced in the inquiries by means of numerals attached to the names of the counties. These show at once whether the statements made in regard to any county are those of one person only or of more than one, and, therefore, in a measure their relative worth. They will serve as an important aid to the formation of an opinion where there may seem to be a conflict of testimony. For example, it may be found that a particular tree is reported as grown successfully and also to have proved a failure in the same general locality. But if it is seen that in one case the statement is based upon the replies of several correspondents, while the adverse report is made by only a single person, the preponderance of evidence will be at once apparent.

Symbols are also used for the purpose of indicating at once the relative geographical positions of the counties in the respective States. Thus the symbol ⊓ attached to the name of a county indicates that it is situated in the northern portion of the State or Territory. ⊐, in like manner indicates northeast, ⊐-, east, ⊔, southeast, ⊓, south, ⊔, southwest, -⊏, west, ⊏, northwest, and □, central. In the great States and Territories of the west, reaching over several degrees of latitude and longitude, and consequently embracing varieties of soil and climate, it will be of advantage to the reader to know, as he may thus at once, to what particular region each report refers.

The replies to the foregoing circular are, on the whole, very encouraging, and show that this comparatively treeless portion of our country presents no insuperable obstacles to tree-growth. The prairies are destitute of trees, not on account of peculiarities of soil or climate, but from other causes. We have ample evidence that they were once clothed with an abundant arboreal growth, and these reports, with other facts, show that they may be covered again with such a growth, so far as it is for any reason desirable. In almost all portions of the prairie region, even those least favorable to vegetable products, on account of the deficiency of the water-supply, groves and belts of trees of various kinds—the result of planting during the last few years—prove that with proper care in the cultivation of trees and in guarding them from injury by fire or by roaming animals, forests may be established in sufficient abundance to meet all demands for lumber and fuel, and to secure those climatic and other influences on account of which forests are so valuable to any country.

In the autumn of last year (1883) two other circulars were sent out to all parts of the country, designed to ascertain the present relative condition of the existing forests, the rate at which they are consumed by being converted into fuel and lumber or destroyed by fires, and the character and value of their products. The following are copies of these circulars:

[A.]

Department of Agriculture, Forestry Division.

To ——— ———:

The Department of Agriculture having been directed by Congress to make certain investigations in reference to *forestry*, the undersigned has been instructed by the

Hon. George B. Loring, Commissioner of Agriculture, to prosecute inquiries upon certain points having reference to this subject in several of the United States, including the one to which this circular is addressed.

In pursuance of this work, you are respectfully requested to return this blank to the undersigned, at ———, with such information and suggestions as you may be able to communicate upon the subjects indicated by the inquiries which follow. Should the spaces allowed be insufficient, supplementary sheets may be used, suitable references being made to the numbers prefixed to the inquiries to which answers are given.

Very respectfully, yours,

——— ———,
Agent of the Department of Agriculture.

July —, 1883.

I. To what extent have the native forests been cleared off within the range of your observation (mentioning the counties or district included), and what kinds of timber are left standing, and what is their general quality? State what proportion of the county or district was formerly covered with wood.

II. For what purposes have the forests been cleared, whether for lumber, fuel, or other uses, or simply to gain land for agricultural purposes, without use of the wood? How far will the growing forests supply the place of those which have been removed?

III. What is the estimated amount of young wood growing naturally? [This amount may be stated in acres, or in percentage of the area of the district reported].

IV. What are the possibilities and advantages of planting forest trees in your region, and to what extent are persons engaged in it?

[Any suggestions, from your own experience or that of others, in regard to the kinds of trees best adapted for cultivation in your region, or as to time and methods of planting or sowing and subsequent management, will be welcome.]

V. To what extent have the woodlands of your region been injured by forest fires?

[Any suggestions as to the causes of such fires, their prevention, or their control after they are begun, will be very acceptable.]

VI. What should the General Government do for the preservation and increase of forests on the public domain?

VII. What is the deterioration of trees in value at given ages?

[This inquiry includes an estimate as to the age at which different species of trees should be cut in order to secure their greatest value.]

Name of person reporting: ——— ———.

Post-office address: ——— ———

Date: ——— —, 1883.

[B.]

Department of Agriculture, Forestry Division.

To ——— ———:

The Department of Agriculture having been directed by Congress to make certain investigations in reference to *forestry*, the undersigned has been instructed by the Hon. George B. Loring, Commissioner of Agriculture, to prosecute inquiries upon certain points relating to this subject.

Among the points upon which full information is desired is the extent of the lumber and wood trade. To obtain such information this circular is sent to you, with the request that it be filled up with your replies to its questions and returned to the undersigned, at ———, at your earliest convenience.

It is proper to say that the information obtained by these inquiries will not be published in connection with the names of those making the returns, but only in aggregates of counties and States. It is obviously for the interest of all engaged in the lumber and wood trade that the published statements should be as accurate as possible, but where precise records of business are not kept the summaries may be made from the best estimates attainable.

Very respectfully, yours,

——— ———,
Agent of the Department of Agriculture.

——— *July*, 1883.

I. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material.

[NOTE.—As the principal object of this inquiry is to ascertain the amount of lumber and other wood products prepared for market, no establishment should be included unless it employs logs, blocks, or timber from the *forest*. Mills for resawing, planing, or other forms of wood-working, in which sawn or otherwise prepared lumber or wood is used as first material *should not be included*.]

II. What amount of logs or timber (estimated in board measure) was used in your factory during the year 1882?
III. What is the estimated amount for the year 1883?
IV. What is the average number of logs required for making 1,000 feet of boards?
V. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

	1882.	1883.
Boards and other sawn lumber	M.	M.
Laths	"	"
Shingles	"	"
Staves	"	"
[Mention other principal products.]		

VI. What suggestions can you offer, as the result of your observations or inquiries, in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?
VII. In the cutting of timber for sawing or manufacture is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.
VIII. What kinds of timber are chiefly used in your business, and the relative amount of each?
IX. Miscellaneous remarks. [Under this head mention any injuries to woodlands under your notice which are taking place, whether from insects or other causes, and notice any other facts that may be deemed of interest in connection with the subject of forestry generally.]

Name of person reporting: ——— ———.
Post-office address: ——— ———.

Date: ——— —, 1883.

The present volume consists largely of replies to these circulars. From the thousands of responses received, the endeavor has been made to form such an abstract and condensation as to constitute a fair and intelligible representation of the returns as a whole. Returns from a few of the States, chiefly those in the eastern portion of the country, have not yet been compiled, but it has not been thought best to delay the publication of this volume on that account.

It will be seen that these reports, representing nearly the whole country, give almost uniform testimony to the rapid and reckless consumption of our forests. Until within a few years past they were often cut and burned for the simple purpose of clearing the land, and in some parts of the country, and those too where forests are not the most abundant, that practice has not yet ceased. The destruction of the forests also by fires, occasioned by hunters, or the carelessness of persons encamping in the woods, has been very great. Property to the value of many millions of dollars has thus annually been destroyed.

Those engaged in the production of lumber have also prosecuted their business to an extent not called for by a legitimate demand, and in a most wasteful manner. The markets have been overstocked, and the mill-owners have seemingly been engaged in a strife to see which could convert, day by day and year by year, the largest amount of forest into lumber. Very often only sections of the trees have been used, while the greater portion has been left to decay upon the ground. The result is that great districts of country, formerly densely covered with timber, have become almost exhausted of their supply. In some cases trees measuring only 4 or 5 inches in diameter, which a few years

ago would not have been thought of for any such use, are now cut and taken to the saw-mills.

Notwithstanding this waste, there seems to be in some of our States, especially those of the South, a great abundance of forests. Yet, even here the reports show that there is not such a forest-wealth as has been supposed to exist. There is hardly any portion of the country, in fact, in which it has not become difficult to find timber of the best quality. This shows beyond question that the appearance of our forest supply is deceptive, and that we have the most urgent motives for the careful and economical use of what forests remain, and for planting trees in many places from which they have been removed, or in those rough and waste places where the cultivation of trees is more feasible and profitable than that of any other crop.

Particular attention is called to the report in regard to the proportions of woodlands in the State of Ohio at different periods. As by law the assessors of this State are obliged to ascertain from year to year, for the purpose of taxation, the amount of woodland as well as that which is cleared and under cultivation, we are able to show from the official records the proportion of woodlands at any given time. In the report here given the amount is ascertained by counties for three periods, the years 1853, 1870, and 1881. Diagrams or graphic maps also accompany the report, which show at a glance the forest condition of each county at the several periods. It will be noticed that in all the counties of the State, with a single exception, there has been a decrease of the forest area during the period of twenty-eight years embraced in the report. It is probable also that in the single exceptional case the exception arises from some error in setting down the figures, and that if these had been given correctly there would have been no county in the State in which a diminution of the forest area would not have been apparent.

Attention is called to this report also, not only for its own sake and its value as presenting important facts in reference to a particular State, but because it shows, in all probability, what would appear as the real condition of the forests in most of the States if we had like official evidence in regard to them. The state of the forests is so intimately connected with the most important interests of the country, with the health and comfort of the people, with the water supply, and consequently with the condition of agriculture, manufactures, and commerce, that it should be one of the foremost subjects of consideration by any people and by any government. The several States cannot too soon give this subject their attention, and the General Government, in the disposal of its remaining lands, as well as by all other appropriate means, should co-operate with the States for the accomplishment of the same common end. Forests are cheaper than dikes or dredges, and their preservation on the headwaters of our great commercial streams would prevent losses to the amount of millions of dollars annually by floods and droughts.

In reply to circulars sent to the railroad companies of the country, reports have been obtained in regard to the demands made by them upon our forests, particularly in regard to the consumption of wood for ties. The various kinds of wood used for this purpose are shown, and the degree of durability possessed by them, together with other facts of interest and importance, making a body of information of much value to the public, and which, it is believed, is now for the first time made readily accessible.

For the first time also, in the report on the "Production of Maple Sugar in the United States and Canada," an exhaustive account is

given of one of our important but comparatively little known industries, yet one which is capable of almost indefinite extension. The maples are among our most valuable trees, both for the variety of uses to which they are adapted and their wide diffusion throughout the larger part of the country. The hard or sugar maple, combining as it does great value for timber, for various uses in the arts, for fuel, and as an ornamental shade tree for planting on the street or the lawn, adds to these its peculiar saccharine quality, and thus becomes perhaps the most valuable of all the deciduous trees. There is hardly a farm on which it may not be made to grow, while on many farms there are rocky or comparatively inaccessible portions, useless or nearly so for agricultural purposes, which, if devoted to the growth of this tree, would become a source of considerable and constant revenue.

Without particularizing further the contents of this volume, it is presented as showing in part the continuous work of the Department of Agriculture through its Bureau of Forestry and the importance of such work to the country.

Respectfully submitted.

N. H. EGLESTON,
Chief of Bureau of Forestry.

Hon. GEORGE B. LORING,
Commissioner of Agriculture.

TREE-PLANTING IN THE PRAIRIE STATES,* AS SHOWN BY THE REPORTS.†

I.—THE KINDS OF TREES, IN ORDER OF PREFERENCE, FOUND TO HAVE BEEN GROWN SUCCESSFULLY.

II.—THE KINDS TRIED WHICH PROVED UNSUCCESSFUL.

III.—THE INJURIES NOTICED TO HAVE OCCURRED FROM INSECTS OR OTHER CAUSES.

IV.—OTHER DIFFICULTIES OBSERVED IN ATTEMPTS AT TREE-PLANTING.

DAKOTA.

I.—THE KINDS OF TREES, IN ORDER OF PREFERENCE, FOUND TO HAVE BEEN GROWN SUCCESSFULLY.

BEADLE COUNTY. □-

(3.) Walnut (black), ash (white), elm (white), cottonwood, box-elder, maple (soft), willow (white), maple (hard), catalpa (hardy), cherry.

BROOKINGS COUNTY. □-

(5.) Cottonwood, ash (white), box-elder, maple (soft), willow (white), walnut (black), poplar (Lombardy), catalpa (hardy), maple (hard), oaks.

BRULÉ COUNTY. □

(2.) Cottonwood, ash (white), box-elder, maple (soft), walnut (black), oak, maple (hard), hickory, catalpa (hardy).

CASS COUNTY. □

(3.) Cottonwood, box-elder, ash (white), butternut (or white walnut), walnut (black), maple (hard), maple (soft), elm (white), elm (red), hickory, basswood (or linden), willow (white), evergreens, oaks, hackberry, poplar (Lombardy), balm of Gilead, cedar (red), spruce (Norway), larch (European), birch, balsam, ironwood.

CHARLES MIX COUNTY. □

(2.) Cottonwood, box-elder, walnut (black), ash (white), oaks, cedar (red), elm (white), willow (white).

---

* Dakota, Illinois, Iowa, Kansas, Minnesota, and Nebraska.

† The symbols used denote the relative positions of the counties in the various States, thus: □, north; □, northeast; □, east; □, southeast; □, south; □, southwest; □, west; □, northwest; □, central. The figures in parentheses indicate the number of reports received.

The symbols or geographical indicators are used by permission of Dr. J. M. Toner, by whom they were devised and copyrighted.

CLARK COUNTY.

(1.) Ash (white), walnut (black), cottonwood, box-elder, hickory, maple (soft), evergreens, butternut (or white walnut), oaks, balm of Gilead, willow (white).

CLAY COUNTY.

(2.) Cottonwood, maple (soft), walnut (black), ash (white), box-elder, elm (white), basswood (or linden), elm (red), hackberry.

CODINGTON COUNTY.

(1.) Ash (white), box-elder, cottonwood, maple (soft), butternut (or white walnut), walnut (black).

CUSTER COUNTY.

(1.) Pines, spruce (Norway), cedar (red), birch, beech, horse-chestnut (or buckeye), maple (hard), ash (white), elm (white), oaks, Osage orange.

DAY COUNTY.

(9.) Cottonwood, ash (white), box-elder, maple (soft), walnut (black), elm (white), oaks, willow (white), butternut (or white walnut), balm of Gilead, maple (hard), cherry, basswood (or linden), birch, beech, balsam fir, elm (red), hackberry, hemlock, spruce (Norway), ironwood, poplar (Lombardy).

DICKEY COUNTY.

(1.) Ash (white), maple (hard).

GRANT COUNTY.

(3.) Cottonwood, ash (white), elm (white), box-elder, maple (soft), basswood (or linden), willow (white), oaks, walnut (black), butternut (or white walnut), poplar (Lombardy).

HAMLIN COUNTY.

(4.) Cottonwood, box-elder, ash (white), willow (white), maple (soft), balm of Gilead, elm (white), oaks.

HUTCHINSON COUNTY.

(9.) Cottonwood, walnut (black), ash (white), maple (soft), box-elder, catalpa (hardy), mulberry, elm (white), locust (black), cherry, willow (white), hickory, maple (hard), Osage orange, poplar (Lombardy), basswood (or linden), barberry, ironwood, hackberry, dogwood, birch, beech, butternut (or white walnut), buttonwood, oaks, chestnut, cucumber, Kentucky coffee, tulip, ailanthus, sassafras, shadblow.

LAKE COUNTY.

(1.) Cottonwood, box-elder, walnut (black), ash (white), maple (soft).

LA MOURE COUNTY.

(5.) Cottonwood, walnut (black), box-elder, ash (white), elm (white), maple (soft), pines, poplar (Lombardy), willow (white), butternut (or white walnut), spruce (Norway), chestnut.

LINCOLN COUNTY.

(18.) Cottonwood, box-elder, ash (white), maple (soft), walnut (black), willow (white), elm (white), maple (hard), butternut (or white walnut), balm of Gilead, larch (European), oaks, hackberry, elm (red), locust (black), chestnut, cherry, basswood (or linden), pines, spruce (Norway), catalpa (hardy), horse-chestnut (or buckeye), ailanthus, tulip, hickory.

M'COOK COUNTY.

(6.) Cottonwood, box-elder, ash (white), walnut (black), maple (soft), poplar (Lombardy), butternut (or white walnut), balm of Gilead, willow (white), elm (white), hackberry, oak, oak (Jack), cherry, spruce (Norway).

MINNEHAHA COUNTY.

(2.) Cottonwood, walnut (black), box-elder, ash (white), poplar (Lombardy), elm (white), butternut (or white walnut), willow (white), maple (soft).

MOODY COUNTY.

(7.) Cottonwood, ash (white), box-elder, walnut (black), maple (soft), willow (white), butternut (or white walnut), maple (hard), oak, elm (white), larch (European), evergreens, hackberry, poplar (Lombardy), elm (red), pines.

MORTON COUNTY.

(1.) Cottonwood, box-elder, maple (hard), maple (soft), ash (white), oak, willow (white).

PEMBINA COUNTY.

(9.) Box-elder, maple (soft), ash (white), cottonwood, willow (white), poplar (Lombardy), oak, maple (hard), balm of Gilead, elm (white).

RICHLAND COUNTY.

(7.) Box-elder, ash (white), willow (white), cottonwood, elm (white), maple (soft), walnut (black), maple (hard), balm of Gilead, beech, spruce (Norway), oak, elm (red), larch (European), ironwood, basswood (or linden).

SPINK COUNTY.

(3.) Cottonwood, walnut (black), willow (white), ash (white), box-elder, maple (soft), oak, butternut (or white walnut), hickory, elm (white), locust (honey).

STEVENS COUNTY.

(1.) Cottonwood, walnut (black).

TRAILL COUNTY.

(4.) Cottonwood, box-elder, ash (white), elm (white), maple (soft), willow (white), ironwood, basswood (or linden), butternut (or white walnut), walnut (black).

TURNER COUNTY.

(14.) Cottonwood, box elder, ash (white), maple (soft), walnut (black), willow (white), mulberry, catalpa (hardy), hackberry, poplar (Lombardy), oak, cedar (red), larch (European), butternut (or white walnut), elm (white), elm (red), locust (honey), spruce (Norway), balm of Gilead, basswood (or linden), pines, chestnut, cherry, ironwood, Kentucky coffee.

UNION COUNTY.

(7.) Cottonwood, box-elder, maple (soft), walnut (black), ash (white), willow (white), elm (white), locusts (honey and black), maple (hard), hackberry, oak, butternut (or white walnut), elm (red).

WALWORTH COUNTY.

(1.) Cottonwood.

SUMMARY.

Forty-seven different kinds of trees are reported from the Territory at large. In order of preference the leading varieties are as follows: Cottonwood, box-elder, ash (white), walnut (black), maple (soft), elm (white), willow (white), oak, maple (hard), butternut (or white walnut), poplar (Lombardy), balm of Gilead, basswood (or linden), catalpa (hardy), hickory, hackberry.

II.—THE KINDS TRIED WHICH PROVED UNSUCCESSFUL.

BROOKINGS COUNTY.

(2.) Balm of Gilead, maple (soft), maple (hard), walnut (black), beech, birch.—These cannot stand hard freezes, and die in winter.

CASS COUNTY.

(1.) Cherry, poplar, (Lombardy).—They die in winter from hard freezes.

CHARLES MIX COUNTY.

(1.) Maple (soft), walnut (black), oak.—The soil is too dry, and hot sun in July kills them.

CLAY COUNTY.

(2.) Maple (hard), poplar (Lombardy), Osage orange, willow (white).—Hard winters kill them. Chestnut, hickory, locust (black).—The soil and climate are unsuitable.

DAY COUNTY.

(1.) Poplar (Lombardy), locust (black), Osage orange.—They die in winter from severity of climate.

GRANT COUNTY.

(1.) Maple (soft).—The severe winter weather kills it to the ground, and the roots send up sprouts in the spring, only to be again destroyed the succeeding winter.

HAMLIN COUNTY.

(3.) Elm (white), maple (soft), maple (hard), beech, ash (white), basswood (or linden), ironwood.—Drought in summer and hard, cold winters kill them; sometimes too much wet weather destroys oaks.

HUTCHINSON COUNTY.

(3.) Maple (hard), beech, spruce (Norway), oak, ash (white), hickory, locust, chestnut.—Of these, the oak and ash seem to be of slow growth, which is the only objection urged. Other kinds die from climatic causes, extremes of heat and cold.

LAKE COUNTY.

(1.) Poplar (Lombardy), Osage orange.—No cause given for failure.

LINCOLN COUNTY.

(5.) Ailanthus, maple (soft), maple (hard), tulip, box-elder, mulberry, poplar (Lombardy), oak, larch (European), chestnut, horse-chestnut (or buckeye), locusts, hickory, willow (white), ash (white), basswood (or linden), ironwood, pecan, butternut (or white walnut).—The hard freezes in winter are the most serious difficulty. Grasshoppers kill some, and gophers are very destructive to young trees, through cutting the roots.

M'COOK COUNTY.

(2.) Catalpa (hardy), maple (soft), poplar (Lombardy), oak, chestnut, hickory, locusts, cottonwood, ash (white).—Killed by hard winter freezes.

MOODY COUNTY.

(1.) Evergreens.—The soil and climate are unsuitable; they die in early spring. Maple (hard) cannot stand severe freezes.

PEMBINA COUNTY.

(1.) Balsam fir, elm (white), maple (hard).—These are uncertain on account of severe winters.

RICHLAND COUNTY.

(1.) Maple (soft).—Winter kills it.

SPINK COUNTY.

(2.) Catalpa (hardy), maple (hard), beech, birch, chestnut, basswood (or linden), evergreens.—All die from extremes of climate, heat and cold.

TRAILL COUNTY.

(2.) Evergreens.—Hot, dry weather and frequent hard freezes kill evergreens, and the maples and white willow die from freezing.

TURNER COUNTY.

(4.) Balm of Gilead, maple (soft), maple (hard), walnut (black), box-elder, butternut (or white walnut), poplar (Lombardy), oak, chestnut, hickory, willow (gray), Osage orange, persimmon, Kentucky coffee, spruce (Norway), evergreens, hazel.—The soil and climate do not seem to be adapted to these varieties; they spring up and look thrifty, but the hard freezes in winter and hot, dry summer weather cause them to perish. Some appear to be of little use, even if raised successfully.

UNION COUNTY.

(2) Catalpa (soft), walnut (black), ash (white), willow (white).—These cannot stand severe winter weather. Pines and cedar (red), are affected by hot sun, but cold hurts them also.

SUMMARY.

Thirty-seven kinds of trees are mentioned as having been tried in various parts of the counties, which did not prove successful. The following is the list, and the number of times each is mentioned in the reports: Maple (hard), 10; maple (soft), 9; chestnut, 6; poplar (Lombardy), 6; ash (white), 5; hickory, 5; locust (black), 5; oak, 5; willow (white), 5; beech, 4; catalpa, 4; evergreens, 4; Osage orange, 4; walnut (black), 4; basswood (or linden), 3; balm of Gilead, 2; birch, 2; box-elder, 2; butternut (or white walnut), 2; elm (white), 2; ironwood, 2; spruce (Norway), 2; and ailanthus, balsam fir, cedar (red), cherry, Kentucky coffee, cottonwood, horse-chestnut, hazel, larch (European), mulberry, pecan, persimmon, pine, and tulip, each once.

III.—THE INJURIES NOTICED TO HAVE OCCURRED FROM INSECTS OR OTHER CAUSES.

BROOKINGS COUNTY.

(1.) The willows and soft maple are the only kinds injured by insects. A worm, known here as the willow-worm, eats the leaves from the trees in July and August, thereby retarding the growth.

BRULÉ COUNTY.

(1.) A little white fly or bug is very destructive to young cottonwoods, cutting them off at the ground when they first come up.

CASS COUNTY.

(1.) Grasshoppers have been very injurious to trees, especially the white willow. Hail has injured trees seriously, and after wind and hail storms soft maples are generally good for nothing, as they split and break badly. Elms suffer most from drought.

CLAY COUNTY.

(1.) The borers sometimes injure cottonwood by cutting the tree under the bark near the ground.

CODINGTON COUNTY.

(1.) Insects occasionally eat off the leaves and twigs, which injures the growth. In hard winters a great many trees are killed by freezing.

CUSTER COUNTY.

(1.) Hardly any trouble, except through caterpillars eating the leaves. Sometimes this hinders the growth.

DAY COUNTY.

(1.) Prairie fires do the most damage. Rabbits injure young trees by eating the top and cutting the bark from the trunk. Gophers do considerable injury by eating or cutting the roots of young trees. (2.) A worm webs the leaves of black walnut, causing some injury, but not serious. (3.) Much injury results from drought during the summer. Grasshoppers eat the leaves and twigs of some kinds of trees.

DICKEY COUNTY.

(1.) White ash is sometimes attacked by a bug, somewhat like the potato-bug, not so large and of a dark blue color.

HAMLIN COUNTY.

(1.) Grasshoppers sometimes prove very injurious by eating the leaves and twigs. (2.) Mice cut and girdle young trees in the winter. A good preventive is tarred paper put around them.

HUTCHINSON COUNTY.

(1.) Cottonwood is sometimes attacked by insects that eat the leaves, causing many trees to die, and retarding the growth of those that survive. (2.) Caterpillars do great injury by stripping the trees of their leaves. (3.) A bug, resembling the potato-bug, does some injury; also grasshoppers. (4.) Box-elder and cottonwood are sometimes attacked by worms that hurt them very much; grasshoppers eat the young leaves and twigs in the spring. (5.) Long, dry spells in summer cause many trees to die.

LA MOURE COUNTY.

(1.) Mice and rabbits do great injury to trees by cutting and girdling them beneath the snow in winter, causing them to die.

LINCOLN COUNTY.

(1.) Grasshoppers injure trees, cottonwood more particularly, by eating the leaves and twigs. A small worm, resembling the silk-worm or caterpillar, attacks box-elder and soft maple and hurts them. (2.) Drought and some kind of an insect injure cottonwood the first year; gophers do considerable damage by cutting the roots; hard freezes in winter kill large numbers of trees; the June-bug and a worm resembling the tobacco worm are very injurious; also a black worm with stripes.

M'COOK COUNTY.

(1.) Locusts are injured very much by borers, also by freezing. Sapsuckers injure cottonwood by picking holes in the trunk of the tree, which causes them to break off in hard winds, when three or four years old.

MINNEHAHA COUNTY.

(1.) Long, green worms, some 5 inches in length, attack the black walnut, eating the leaves and leaving the tree in a nude state, thereby retarding its growth. White willow is sometimes injured by a striped worm or caterpillar.

MOODY COUNTY.

(1.) Insects frequently attack elms and kill them. (2.) Borers are very destructive to white ash; grasshoppers injure cottonwood by eating the leaves and twigs in the spring. (3.) A small black insect injures the cottonwood by eating the leaves; also, a small fly stings the leaves and does injury. (4.) A large worm, resembling the silk-worm, is very injurious to box-elder. (5.) Cottonwood is sometimes sun-scalded; the bark turns black on the south side of the tree at the ground, bursts or cracks open, then the insects cut in and soon the tree dies.

PEMBINA COUNTY.

(1.) Hard freezes do great damage. (2.) Soft maples, when they first come up, are sometimes attacked by the cut-worm, very much like the cabbage cut-worm.

RICHLAND COUNTY.

(1.) Freezes are very injurious, and grasshoppers do some hurt. (2.) Maples are sometimes injured by a worm or borer that cuts into the heart of the tree. (3.) Rabbits are very injurious in some seasons, eating off the bark just above the ground.

SPINK COUNTY.

(1.) The white grub-worm occasionally cuts the roots badly, causing the trees to die; this applies exclusively to bottom-lands. (2.) The hot, dry winds of July and August injure trees very much.

TRAILL COUNTY.

(1.) Gophers injure trees to some extent by cutting the roots.

TURNER COUNTY.

(1.) Prairie fires are very damaging, and heavy freezes kill large numbers of trees These two causes are the most injurious. (2.) Grasshoppers and June-bugs do some injury. Large green worms sometimes attack willows. Cottonwood has suffered injury from striped bugs and caterpillars. Grub-worms do much damage, and rabbits are very injurious. A gray worm attacks the box-elder by boring or cutting into the tree at the ground; when it reaches the pith or heart of the tree it turns up towards the top, and very soon the tree dies.

UNION COUNTY.

(1.) Some years grasshoppers injure trees very materially.

IV.—Other difficulties observed in attempts at tree-planting.

BROOKINGS COUNTY.

(1.) The greatest impediment arises from not having the land sufficiently subdued before planting. The law allows but one year before planting trees, and consequently the prairie sod is not sufficiently pulverized to retain the moisture necessary to keep the trees alive. (2.) Carelessness in planting.

BRULÉ COUNTY.

(1.) Carelessness, mostly in planting.

CASS COUNTY.

(1.) Setting trees in unsubdued prairie land is the greatest difficulty experienced in successful tree-planting.

CHARLES MIX COUNTY.

(1.) Want of labor. (2.) Many young groves are destroyed by prairie fires.

CUSTER COUNTY.

(1.) Want of proper attention and cultivation, and not watering trees when young.

DAY COUNTY.

(1.) Want of skilled laborers, planting out of season, and general neglect after planting. (2.) Want of energy and "push." (3.) Planting trees with too much top causes many to be destroyed by wind before they are well rooted. (4.) Carelessness in planting kills more trees than all other causes combined.

GRANT COUNTY.

(1.) In wet weather, the rapid growth of weeds occasions serious difficulty in raising young trees.

HUTCHINSON COUNTY.

(1.) Planting trees before the sod is well broken is a serious difficulty. Droughts in summer are injurious. (2.) Severe, high, cold winter winds, dry atmosphere and prairie fires. (3.) Dry weather in spring. (4.) One great difficulty lies in the new and unsubdued land; trees planted before the sod is pulverized, seldom live.

LAKE COUNTY.

(1.) Failure to get the soil in proper condition before planting, and want of care and cultivation afterwards.

LA MOURE COUNTY.

(1.) The greatest difficulty arises from the dry, hot weather in July, August and September, causing trees to die before they take root. (2.) Planting in the rough prairie sod before it is thoroughly subdued causes large numbers of trees to die for want of moisture.

LINCOLN COUNTY.

(1.) Sometimes the rapid growth of trees is a disadvantage, as they are more tender and hence subject to winter-kill. When this is the case, they should be cut back. (2.) Droughts in summer. (3.) Prairie fires do more damage than all other causes. (4.) Negligence in preparing "fire breaks," and proper cultivation of trees. (5.) A great difficulty lies in the neglect to mulch young trees, as this creates and holds the moisture.

M'COOK COUNTY.

(1.) One trouble is, farmers purchase seedlings, which do not live so well. (2.) Negligence and want of proper cultivation.

MOODY COUNTY.

(1.) Excessive wet weather in spring causes heavy growth of weeds, which greatly damage young trees. (2.) Dry, hot winds. (3.) Negligence in preparation of soil, and want of proper attention and cultivation afterwards.

PEMBINA COUNTY.

(1.) One of the greatest difficulties is not preparing the land properly before planting. (2.) Fire and weeds are obstacles. (3.) Want of care and attention. (4.) Too much wet weather in spring. (5.) Negligence in preparing the soil. (6.) Planting before the prairie sod is pulverized.

RICHLAND COUNTY.

(1.) Planting trees in new land before the sod is pulverized. (2.) Want of proper preparation of soil, non-attention and neglect of cultivation. (3.) Wet and dry seasons.

SPINK COUNTY.

(1.) Negligence in giving proper attention to planting and culture.

STEVENS COUNTY.

(1.) Droughts and dry winds are the most serious difficulties.

TRAILL COUNTY.

(1.) Poor planting and negligence in cultivation. (2.) Negligence generally.

TURNER COUNTY.

(1.) "Shiftlessness" is the main difficulty. (2.) Rapid growth of weeds. (3.) Want of care in planting and proper cultivation. (4.) Long dry spells. (5.) Want of thorough culture, so as to keep the weeds down. (6.) Prairie fires and carelessness. (7.) Dry weather in spring at time of tree planting.

UNION COUNTY.

(1.) Dry weather at the time of planting, and long droughts before the trees take root. (2.) Want of thorough preparation of soil and proper cultivation.

ILLINOIS.

I.—THE KINDS OF TREES, IN ORDER OF PREFERENCE, FOUND TO HAVE BEEN GROWN SUCCESSFULLY.

ALEXANDER COUNTY.

(1.) Pecan, walnut (black), box-elder, cottonwood.

BOONE COUNTY.

(1.) Maple (soft), elm (white), maple (hard), willow (gray), cottonwood.

BUREAU COUNTY.

(4.) Walnut (black), maple (soft), box-elder, pine (white), larch (European), pine (Scotch), elm (white), spruce (Norway), arbor-vitæ, poplar (Lombardy), cottonwood, butternut (or white walnut), oak (burr), locust (honey), hemlock, cedar (red), ash (white), ash (black), catalpa, willow (white), balsam fir, pine (Austrian), locust (black), pine (Norway), ash (mountain), larch (American), elm (red), oak (white), oak (red), cherry, sycamore, Osage orange.

CARROLL COUNTY.

(4.) Walnut (black), maple (soft), locust (honey), willow (white), maple (hard), pine (white), box-elder, oak (burr), oak (red), larch (European), oak (white), ash (white), cottonwood, Osage orange, elm (white), catalpa, basswood (or linden), butternut or (white walnut), cedar (red), hickory, pine (Scotch), pine (Austrian), balsam fir.

CHRISTIAN COUNTY.

(12.) Maple (soft), walnut (black), maple (hard), cottonwood, ash (white), box-elder, elm (white), locust (black), Osage orange, pine (white), spruce (Norway), mulberry, willow (white), hickory, locust (honey), cedar (red), poplar (Lombardy), pine (Scotch), larch (European), oak (post), butternut (or white walnut), oak (burr), oak (white), oak (red), pecan, basswood (or linden), ash (black), persimmon, cherry, catalpa, pine (Austrian).

CLAY COUNTY.

(3.) Maple (soft), maple (hard), elm (red), ash (white), walnut (black), cottonwood, catalpa, box-elder, oak (black), oak (red), oak (burr), hickory, poplar (Lombardy), locust (yellow).

CLINTON COUNTY.

(2.) Maple (soft), walnut (black), elm (white), maple (hard), ash (white), ash (mountain), ash (black), elm (red), locust (honey), mulberry, magnolia, tulip, butternut (or white walnut), chestnut, pecan, horse-chestnut (or buckeye), cottonwood, poplar (Lombardy), catalpa, larch (European), basswood (or linden), willow (white), cedar (white), spruce (Norway), pine (Scotch), pine (white), pine (Austrian), arbor-vitæ, cedar (red), beech, box-elder, yew, hemlock.

COLES COUNTY.

(3.) Maple (soft), walnut (black), maple (hard), catalpa, elm (white), cottonwood, tulip, poplar (Lombardy), Osage orange, butternut (or white walnut), chestnut, beech, hickory, oak (burr), oak (white), oak (red).

COOK COUNTY.

(2.) Elm (white), ash (white), maple (soft), birch, catalpa, walnut (black), basswood (or linden) box-elder, cherry, hackberry, spruce (Norway), ash (mountain), oak (burr), larch (European), butternut (or white walnut), poplar (Lombardy), mulberry, tulip, locust (honey), pine (white), pine (Austrian), pine (Scotch), arbor-vitæ, sycamore.

DE WITT COUNTY.

(3.) Maple (soft), maple (hard), walnut (black), willow (white), elm (red), box-elder, Osage orange, butternut (or white walnut), oak (white), oak (burr), locust (honey).

DOUGLAS COUNTY.

(7.) Maple (soft), walnut (black), maple (hard), cottonwood, ash (white), box-elder, elm (white), catalpa, willow (white), Osage orange, hickory, mulberry, chestnut, butternut (or white walnut), cedar (red), balsam fir, locust (honey), locust (black), poplar (Lombardy), cherry.

DU PAGE COUNTY.

(2.) Maple (soft), box-elder, walnut (black), elm (white), ash (white), elm (red), butternut (or white walnut), willow (white), basswood (or linden), maple (hard), cottonwood, catalpa, larch (European), arbor-vitæ, pine (Scotch), pine (white), pine (Austrian), spruce (Norway), locust (honey), ash (black), larch (American), sycamore, hemlock, balsam fir, cedar (red).

EFFINGHAM COUNTY.

(7.) Maple (soft), walnut (black), maple (hard), elm (white), cottonwood, locust (honey), ash (black), ash (white), locust (black), catalpa, butternut (or white walnut), oak (white), oak (post), sycamore, hickory, oak (red), oak (burr), willow (white), box-elder, poplar (Lombardy), persimmon, tulip, mulberry, elm (red), chestnut, cherry, pine (white), cedar (red).

FORD COUNTY.

(4.) Walnut (black), maple (soft), cottonwood, pine (white), ash (white), cedar (red), willow (white), maple (hard), pine (Scotch), balsam fir, spruce (Norway), Osage orange, poplar (Lombardy), box-elder, larch (European), catalpa, arbor-vitæ, pine (Austrian), elm (white), birch, ash (black), ash (mountain), mulberry, tulip, hickory, oak (white), sycamore.

FRANKLIN COUNTY.

(4.) Maple (soft), walnut (black), cottonwood, persimmon, oak (white), oak (burr), cedar (red), mulberry, sassafras, locust (honey), pine (white), pine (Scotch), pine (Austrian), maple (hard), elm (white), box-elder, chestnut, tulip, willow (white), ash (white), locust (black), aspen.

FULTON COUNTY.

(6.) Maple (hard), maple (soft), walnut (black), cottonwood, oak (white), oak (burr), elm (white), hickory, basswood, (or linden), box-elder, ash (white), oak (black), ash (black), butternut (or white walnut), pine (white), balsam fir, persimmon, cherry, locust (black), locust (honey), sycamore, elm (red), chestnut, willow (white).

GREENE COUNTY.

(2.) Walnut (black), elm (white), maple (soft), Osage orange, catalpa, oak (black), oak (white), hickory, ash (white), cedar (red), cherry, hackberry, elm (red), cottonwood, butternut (or white walnut), sycamore, poplar (Lombardy), locust (honey), locust (black), maple (hard), persimmon, mulberry, ironwood, willow (white), chestnut, pine (white), pine (Scotch), pine (Austrian).

HANCOCK COUNTY.

(4.) Walnut (black), maple (soft), maple (hard), elm (white), elm (red), oak (burr), oak (red), oak (white), cottonwood, locust (honey), cherry, ash (white), ash (black), ash (mountain), coffee, mulberry, larch (European), hickory, poplar (Lombardy), willow (white), Osage orange, basswood (or linden,) persimmon, cedar (red), pine (Scotch), pine (white), spruce (Norway.)

HENRY COUNTY.

(2.) Maple (soft), maple (hard), walnut (black), box-elder, pine (white), pine (Scotch), pine (Austrian), ash (white), arbor-vitæ, spruce (Norway), hickory, elm (red), locust (honey), oak (burr), oak (white), oak (red), cottonwood, larch (European), catalpa, balsam fir, butternut (or white walnut), hemlock, ash (mountain).

IROQUOIS COUNTY.

(7.) Maple (soft), walnut (black), maple (hard), cottonwood, elm (white), box-elder, ash (white), ash (black), basswood (or linden), horse-chestnut (or buckeye), butternut (or white walnut), elm (red), willow (white), catalpa, oak (burr), oak (white), poplar (Lombardy), balsam fir, pine (Scotch), hickory, hackberry, ash (mountain), spruce (Norway), balm of Gilead, birch, mulberry, cherry, oak (red), sycamore, tulip, locust (honey).

JERSEY COUNTY.

(2.) Walnut (black), cottonwood, maple (soft), elm (white), locust (black), willow (white), ash (white), Osage orange, maple (hard), pecan, hickory, chestnut, persimmon.

JO DAVIESS COUNTY.

(1.) Larch (European), pine (white), pine (Scotch), spruce (Norway), arbor-vitæ, walnut (black), willow (white), elm (white).

JOHNSON COUNTY.

(1.) Maple (soft), maple (hard), cottonwood, willow (white), walnut (black).

KANE COUNTY.

(6.) Maple (soft), ash (white), walnut (black), cottonwood, maple (hard), elm (white), spruce (Norway), pine (white), pine (Scotch), larch (European), pine (Austrian), locust (honey), oak (burr), oak (white), oak (red), hickory, box-elder, poplar (Lombardy), basswood (or linden), catalpa, butternut (or white walnut), cedar (red), willow (white), arbor-vitæ, balsam fir, ash (mountain), balm of Gilead, hemlock, larch (American), cherry, elm (red), redbud, chestnut, horse-chestnut (or buckeye), birch, oak (post), ash (black).

KANKAKEE COUNTY.

(6.) Walnut (black), ash (white), maple (soft), maple (hard), box-elder, elm (white), catalpa, elm (red), cottonwood, oak (burr), oak (white), oak (black), butternut (or white walnut), cherry, ash (black), hickory, basswood (or linden), pine (white), pine (Scotch), pine (Austrian), cedar (red), larch (European), spuce (Norway), arbor-vitæ, tulip, sycamore, mulberry, balm of Gilead, willow (white), locust (honey), larch (American), poplar (Lombardy), balsam fir, hemlock, chestnut, oak (post), locust (black), horse-chestnut (or buckeye), birch, ailanthus, sweet-gum, Osage orange, beech.

KENDALL COUNTY.

(6.) Maple (hard), maple (soft), walnut (black), box-elder, catalpa, elm (white), larch (European), butternut (or white walnut), spruce (Norway), mulberry, cottonwood, pine (white), Osage orange, cedar (red), arbor-vitæ, hemlock, chestnut, oak (white), oak (burr), oak (red), locust (honey), ash (black), sycamore, hickory, ash (white), pine (Scotch), redbud, beech, dogwood, hackberry, balsam fir, elm (red), ironwood, cherry, Kentucky coffee, willow (white), poplar (Lombardy), cedar (white), ash (mountain), locust (black).

LAKE COUNTY.

(1.) Pine (white), catalpa, cherry, larch (European), ash (white), walnut (black).

LIVINGSTON COUNTY.

(3.) Walnut (black), maple (soft), maple (hard), box-elder, basswood (or linden), elm (white), oak (white), hickory, cottonwood, ash (black), balsam fir, cedar (red), oak (black), oak (burr), catalpa, butternut (or white walnut), tamarack, ash (white), hackberry, chestnut, willow (white), cherry.

M'HENRY COUNTY.

(10.) Maple (soft), maple (hard), oak (burr), ash (wh ite), walnut (black), oak (black), oak (white), box-elder, cottonwood, elm (white), pine (white), pine (Scotch), pine (Austrian), spruce (Norway), hickory, ash (black), cherry, poplar (Lombardy), butternut (or white walnut), cedar (white), larch (European), hemlock, locust (honey), locust (black), basswood (or linden), elm (red), willow (white), arbor-vitæ, chestnut, cedar (red), sycamore, balsam fir, catalpa, birch, horse-chestnut (or buckeye), larch (American), redbud, hackberry.

MARION COUNTY.

(4.) Walnut (black), maple (soft), elm (white), cottonwood, oak (white), hickory, sycamore, cherry, catalpa, ash (white), chestnut, locust (honey), willow (white), poplar (Lombardy), maple (hard).

MARSHALL COUNTY.

(4.) Maple (soft), walnut (black), maple (hard), elm (white), oak (burr), oak (white), oak (red), Osage orange, cottonwood, catalpa, elm (red), locust (honey), locust (black), hickory, willow (white), box-elder, basswood (or linden), hackberry, ash (white), butternut (or white walnut), sycamore, pecan, Kentucky coffee.

MASSAC COUNTY.

(2.) Maple (soft), catalpa, walnut (black), locust (black), oak (white), oak (red), hickory, cedar (red), mulberry, tulip, ash (white), sweet-gum, maple (hard).

MERCER COUNTY.

(1.) Walnut (black), catalpa, larch (European), ash (white), ash (black), oak (burr), oak (white), butternut (or white walnut), larch (American), chestnut, willow (white).

PIKE COUNTY.

(1.) Maple (soft), maple (hard), walnut (black), ash (black), cottonwood.

ROCK ISLAND COUNTY.

(7.) Walnut (black), maple (soft), cottonwood, elm (white), elm (red), ash (white), locust (honey), oak (white), cedar (red), box-elder, basswood (or linden), Osage orange, pine (white), pine (Scotch), pine (Austrian), oak (black), oak (burr), hickory, locust (black), chestnut, spruce (Norway), hemlock, larch (European), beech, willow (white), ash (black), tulip.

SCOTT COUNTY.

(1.) Maple (soft), locust (black), walnut (black), sycamore, cottonwood, oak (burr), oak (white).

SHELBY COUNTY.

(7.) Walnut (black), maple (soft), cottonwood, maple (hard), locust (black), ash (white), oak (burr), locust (honey), elm (white), box-elder, willow (white), hackberry, sycamore, oak (white), Osage orange, cherry, hickory.

STEPHENSON COUNTY.

(8.) Walnut (black), maple (soft), maple (hard), box-elder, cottonwood, pine (Scotch), willow (white), larch (European), spruce (Norway), butternut (or white walnut), elm (white), ash (white), pine (Austrian), pine (white), oak (white), locust (honey), cedar (red), arbor-vitæ, cherry, chestnut, oak (burr), oak (red), hickory, poplar (Lombardy), balsam fir, ash (black), basswood (or linden), larch (American), locust (black), balm of Gilead, hackberry, ironwood, horse chestnut (or buckeye), sycamore, birch, Osage orange, tulip, aspen, elm (red), catalpa, hemlock, beech.

TAZEWELL COUNTY.

(1.) Walnut (black), locust (black), ash (white), locust (honey), catalpa, cherry, Osage orange.

VERMILLION COUNTY.

(1.) Walnut (black), ash (white), oak (burr), cottonwood, willow (white), hickory, maple (hard), cedar (red), Osage orange.

WARREN COUNTY.

(5.) Walnut (black), maple (soft), willow (white), ash (white), butternut (or white walnut), maple (hard), cottonwood, pine (white), pine (Scotch), locust (black), catalpa, cedar (red), spruce (Norway), larch (European), cedar (white), pine (Austrian), Osage orange, ash (black), tulip, hemlock, redbud, cherry, elm (white), chestnut, box-elder, basswood (or linden.)

WASHINGTON COUNTY.

(1.) Maple (soft), ash (white), elm (white), elm (red), sycamore, hackberry, walnut (black), butternut (or white walnut), hickory, pecan, pine (white), pine (Scotch), cedar (red), spruce (Norway), balsam fir.

WAYNE COUNTY.

(1.) Maple (soft), maple (hard), elm (white), sycamore, catalpa, ash (white), walnut (black), tulip, poplar (Lombardy), locust (honey).

WHITESIDE COUNTY.

(4.) Walnut (black), maple (soft), box-elder, cottonwood, maple (hard), butternut (or white walnut), elm (white), catalpa, hackberry, ash (white), larch (European), locust (honey), spruce (Norway), arbor-vitæ, oak (white), willow (white), ash (black), pine (Scotch), pine (white), pine (Austrian), elm (red), Kentucky coffee, oak (burr), balsam fir, poplar (Lombardy), hickory, birch.

SUMMARY.

Sixty kinds of trees are reported from the State at large. In order of preference, the leading varieties are as follows: (1) Maple (soft), (2) walnut (black), (3) maple (hard), (4) cottonwood, (5) ash (white), (6) elm (white), (7) box-elder, (8) oak (white), (9) catalpa, (10) oak (burr), (11) pine (white), (12) willow (white), (13) locust (honey), (14) butternut (or white walnut), (15) Osage orange, (16) hickory, (17) spruce (Norway), (18) elm (red), (19) larch (European), (20) ash (black), (21) pine (Scotch), (22) cedar (red), (23) cherry, (24) locust (black), (25) oak (black), (26) mulberry, (27) basswood (or linden), (28) sycamore, (29) hackberry, (30) oak (red), (31) pine (Austrian), (32) poplar (Lombardy), (33) arbor vitae, (34) chestnut, (35) pecan.

II.—THE KINDS TRIED WHICH PROVED UNSUCCESSFUL.

BOONE COUNTY.

(2.) Poplars (Lombardy) thrive and grow well from twelve to twenty years, when they begin to die at the top and soon expire to the roots. Locusts (black) are a failure. Formerly they were considered valuable trees, but the borers have destroyed them almost to annihilation. Cottonwoods are of very little value, except for shade. The wood is soft and unfit for timber or fuel.

BUREAU COUNTY.

(5.) Locusts (black and yellow) are subject to attacks of borers and killed very badly. Cottonwoods are of very little value either for lumber or fuel. Poplars (Lombardy) are short-lived.

CARROLL COUNTY.

(2.) Locusts (black) are killed by borers very badly. They also have a propensity to throw up a great many sprouts, which is very objectionable. Poplars (Lombardy) are short-lived, do not succeed, and commence to die at the top in a few years. The cause is not known.

CHRISTIAN COUNTY.

(6.) Pines (Austrian and Scotch) are injured by sap-suckers picking into the wood; when heavy snows fall, large numbers break off. Locusts (black) and maples (soft) are affected by borers. Poplars (Lombardy) and mulberry are short-lived and winter-killed. Beech, persimmon, and tulip all fail. The cause is unknown, unless it be the soil and climate.

CLAY COUNTY.

(1.) Locusts (yellow) are destroyed by borers.

CLINTON COUNTY.

(1.) Tulips, walnuts (English), poplars, beech, and evergreens are all more or less affected by heat and cold. They are not hardy enough to stand the extremes of winter and summer.

COLES COUNTY.

(2.) The entire locust family are killed by borers. Poplars (Lombardy) are short-lived, not existing over ten or fifteen years.

COOK COUNTY.

(1.) Maples (hard) are affected by borers, and large numbers killed. Chestnuts, hickories and beech are not suited to the soil or climate, or both.

DE WITT COUNTY.

(3.) Locusts (black) are killed by borers. Catalpas and sycamores are destroyed by hard freezes, and poplars (Lombardy) are short-lived.

DOUGLAS COUNTY.

(1.) Chestnuts are a failure on account of the soil, which does not suit them.

DU PAGE COUNTY.

(1.) Chestnuts and beech are not suitable to the soil. Pines, evergreens, tulips and magnolias are winter-killed. They are not hardy enough to stand the hard freezes.

EFFINGHAM COUNTY.

(1.) Maples (hard) are winter-killed, and sometimes are attacked by borers.

FORD COUNTY.

(2.) Locusts (black) are a failure, on account of the great destruction by borers.

FULTON COUNTY.

(2.) Catalpas are winter-killed, locusts (black) are destroyed by borers, and walnuts (black) do not succeed on flat, wet prairies. Chestnuts, larches, pines, spruces, tulips and beech are not suited to the soil.

HANCOCK COUNTY.

(3.) Chestnuts fail; the soil is not suitable. Poplars (Lombardy) are short-lived. Locusts (black) are killed by borers, and box-elders are of no value whatever.

HENRY COUNTY.

(1.) Ailanthus and juniper are winter-killed. Locusts (black and yellow) are destroyed by borers, and hemlock and chestnuts are not suited to the soil and climate.

IROQUOIS COUNTY.

(5.) Locusts (black) and maples are killed by borers. Poplars (Lombardy) are short-lived. They live only a few years.

JERSEY COUNTY.

(2.) Juniper (Irish) is unsuited to the climate. The sun is too hot, which kills the tree. Locusts (black) are a failure on account of the ravages of borers.

JO DAVIESS COUNTY.

(1.) Locusts (black and yellow) are destroyed by borers; chestnuts are unsuited to the soil and climate.

KANE COUNTY.

(4.) Locusts (black and yellow), are killed by borers; chestnuts are not suited to soil and climate; larch (American) is killed by hot sun in mid-summer, and poplars (Lombardy) live only a few years.

KANKAKEE COUNTY.

(5.) Poplars (Lombardy) are winter-killed and short-lived generally; locusts (black and yellow) are killed by borers; ash and balm of Gilead are winter-killed; hickories die badly; cause not known. Ailanthus is not hardy, cannot stand severe freezes, and hawthorn and cottonwood seem to be short-lived and die in winter.

KENDALL COUNTY.

(4.) Chestnuts are not suited to soil and climate; poplars (Lombardy) are short-lived, and die out in from ten to twenty years. Locusts (black and yellow), maples and some kinds of ash, are killed by borers; hemlock cannot stand the hard winter freezes.

LIVINGSTON COUNTY.

(1.) Ash (mountain), locusts, and poplar (silver-leafed), are killed by borers; poplars (Lombardy) are short-lived; horse-chestnut (or buckeye), dies out very soon, as the soil does not seem suitable.

M'HENRY COUNTY.

(5.) Beech, birch, chestnuts and hickories are not suited to soil and climate; locusts of all kinds, especially black, are more or less affected by borers. Poplars (Lombardy) die very soon; pines (white) fail because there is not enough sand in the soil.

MARSHALL COUNTY.

(4.) Locusts (black) are killed by borers; hickories and poplars (silver-leafed) suffer very much from the same cause, and poplars (Lombardy) are short-lived.

ROCK ISLAND COUNTY.

(4.) The locust family are very much injured by borers, the black being almost exterminated.

SHELBY COUNTY.

(1.) Locusts (black) are almost entirely killed out by borers.

STEPHENSON COUNTY.

(2.) Locusts are killed by borers; chestnuts are not suited to soil and climate, and poplars (Lombardy) are short-lived.

VERMILLION COUNTY.

(1.) Locusts (black) are killed by borers; poplars (Lombardy) are winter-killed, and are naturally very short-lived trees.

WARREN COUNTY.

(3.) (Poplars (Lombardy) are short-lived, and locusts are killed by borers.

WASHINGTON COUNTY.

(1.) Balsam fir, spruces, arbor vitæ, and hemlock cannot stand the hot, dry weather in summer.

WAYNE COUNTY.

(1.) Locusts (black) seem to be specially attacked by borers.

WHITESIDES COUNTY.

(5.) Locusts (black) are killed by borers; cottonwoods are worthless; poplars (Lombardy) are short-lived, and Osage orange is winter-killed; pines of all kinds and beech are not suited to soil and climate.

SUMMARY.

Thirty-seven kinds of trees are mentioned as having been tried, which did not prove successful. The following is the list and the number of times each is mentioned in the reports:

Locust (black), 26; poplar (Lombardy), 18; locust (yellow), 11; chestnut, 10; beech, 8; hickory, 4; maple (hard), 4; tulip, 4; ash, 3; cottonwood, 3; hemlock, 5; maple (soft), 3; ailanthus, 2; catalpa, 2; evergreens, 2; juniper, 2; larches, 2; pines, 2; poplar (silver-leaf), 2; and arbor vitæ, balm of Gilead, balsam fir, birch, box-elder, hawthorn, horse-chestnut, magnolia, mulberry, Osage orange, persimmon, pine (Austrian), pine (Scotch), pine (white), spruces, sycamore, walnut (black), and walnut (English), each once.

III.—THE INJURIES NOTICED TO HAVE OCCURRED FROM INSECTS, OR OTHER CAUSES.

BUREAU COUNTY.

(1.) The borers are very destructive to locusts (black), and sometimes injurious to maples (soft). (2.) Borers are fatal to locusts (black). They kill them so badly that few, if any, are planted.

CARROLL COUNTY.

(1.) The canker worm is sometimes very injurious to forest trees. (2.) The borers kill the locusts (black and yellow), and a species of the borer family injures poplars (Lombardy). (3.) Caterpillars are troublesome, but the greatest injury from insects is done by the borers. (4.) Caterpillars and lice infest soft-wood trees more or less, the locusts (yellow) suffering most.

CHRISTIAN COUNTY.

(1.) If trees are trimmed too high they are liable to be injured by "sun-scald." The sun kills the bark on the south side of the tree, causing it to crack and roll up as if it had been scalded. (2.) A small, white borer cuts the maple (soft) to some extent. (3.) Severe frosts sometimes cause the bark to crack on the maple (soft). (4.) Borers injure the maple (soft). (5.) Borers are very destructive. They cut into the wood of the tree and the winds break it off. (6.) The borers and "sun-scald" have caused great injury to the maples (hard and soft). (7.) The borers injure the maples, but rabbits do the most injury; they literally eat up the hickories and chestnuts. Dry weather is very injurious. (8.) Borers kill the locusts badly. (9.) The borers completely kill out the locusts (black). They commence when the trees are about five years old.

CLINTON COUNTY.

(1.) The flat-head borers are the greatest pest to forest trees. The maples, elms, ash (white), and the locust family, are all more or less injured by them. There are various kinds of caterpillars that do some injury to box-elders, the maples, balm of Gilead, mulberry, walnuts, Osage orange, and occasionally ash (white). (2.) The web or tape worm has done considerable damage, and caterpillars are sometimes injurious.

COLES COUNTY.

(1.) The borers attack all kinds of locusts, and large numbers are killed. (2.) Dry weather is very injurious.

COOK COUNTY.

(1.) The borers injure ash (mountain), maples (hard and soft), mulberry, and pines, (Austrian and Scotch). (2.) Borers kill maples (hard), and large, green worms injure box-elder.

DE WITT COUNTY.

(1.) An insect, name not known, is doing serious damage to the maples (soft); they carve or cut the wood so that the trees die very rapidly.

DOUGLAS COUNTY.

(1.) The borers injure maples (soft) very much. They cut the limbs so badly that they are easily broken off by the wind.

DU PAGE COUNTY.

(1.) The borers are the only insects that do any injury. They are fatal to the locust family, and sometimes injure the hickories.

EFFINGHAM COUNTY.

(1.) The borers are destructive to the locusts. They attack them when the trees are quite young. (2.) Grubs sometimes destroy whole groves of trees, but they are worse on the oaks. (3.) The Rocky Mountain locusts some years do much damage.

FRANKLIN COUNTY.

(1.) The "swinging" caterpillars have done great injury to hickories and oaks (white). (2.) The measuring worms injure hickories.

FULTON COUNTY.

(1.) By the ravages of the borers, the locusts (black) have almost become extinct. (2.) The "tent" caterpillar is very destructive at times.

HANCOCK COUNTY.

(1.) The trunk borer kills the maples (hard and soft) very badly.

HENRY COUNTY.

(1.) Borers and the "leaf-roller" are injurious to forest trees; large numbers are killed by borers.

IROQUOIS COUNTY.

(1.) The borers kill the locusts very badly, and commence their work when the trees are quite young.

JERSEY COUNTY.

(1.) Borers and caterpillars injure the locusts.

JOHNSON COUNTY.

(1.) The borers kill large numbers of locusts (black).

KANE COUNTY.

(1.) Long-continued droughts are injurious. (2.) Borers injure locusts (black), and maples (hard). (3.) The beetle, commonly called the "June bug," injures cottonwoods, ash (white), walnuts (black), and poplars.

KANKAKEE COUNTY.

(1.) Borers of various kinds have ruined the locusts (black), injured the mulberries (red), and now attack the hickories and maples (hard and soft). (2.) The borers have completely destroyed the locusts (black), and injure the maples very much. (3.) The borers sometimes injure the maples and ash. (4.) An insect of some kind injures the elms, causing galls or knots to swell up on them. (5.) Borers completely destroy locusts (yellow); they also injure ash (white), causing it to break off where the borers cut the wood.

KENDALL COUNTY.

(1.) Since 1855 the borers have destroyed the locusts entirely. The wind injures maple (soft), causing it to break and split very badly.

LIVINGSTON COUNTY.

(1.) The borers injure maples (soft) and elms. (2.) Borers kill locusts (black) and injure maples (soft) to some extent. (3.) Leaf insects do some injury to maples (soft) and walnuts (black) by destroying the foliage; borers also do some injury.

M'HENRY COUNTY.

(1.) A white grub kills the locusts. (2.) Borers have killed out the locusts (black), and do considerable injury to maples (hard). (3.) A species of grub has killed large numbers of oaks (black and red). They cut into the wood under the bark. (4.) The borers destroy the locusts. Some kind of insect kills the poplars (Lombardy) very badly; very few live over twenty years. The attack on the trees is made at the top. (5.) The tree borer or saw worm, also the canker worm, injure forest trees very much. (6.) Borers kill the locusts.

MARSHALL COUNTY.

(1.) The grub is the worst enemy to forest trees of all kinds with which the farmer has to contend. (2.) The borers do great damage.

ROCK ISLAND COUNTY.

(1.) The borers are very destructive to locusts (black), so much so that very few are planted except where no other trees will grow. (2.) The borers kill a great many trees, and in some instances the "bark-lice" are injurious. (3.) The borers have killed out all the locust groves in the community.

SHELBY COUNTY.

(1.) The borers have done great damage, and caterpillars cause some trouble. (2.) The borers and hot, dry weather are injurious.

STEPHENSON COUNTY.

(1.) Borers entirely destroy locusts (black). (2.) Black caterpillars do some injury to the walnuts (black) by eating the leaves in July and August. (3.) Caterpillars of various kinds and rabbits do some injury, the latter the greatest.

VERMILLION COUNTY.

(1.) The borers injure the locusts (black), in many instances completely destroying them.

WARREN COUNTY.

(1.) Horses, cattle, sheep, and hogs do great damage to trees. (2.) Borers are very bad on the locusts (black), completely destroying them in some localities. (3.) The borers completely destroy locusts (black).

WASHINGTON COUNTY.

(1.) Caterpillars injure walnuts and elms. (2.) Borers do great injury.

WAYNE COUNTY.

(1.) The borers kill locusts (black) so badly that but few are planted.

WHITESIDES COUNTY.

(1.) Borers have almost entirely destroyed the locusts (black). (2.) Borers and canker-worms injure locusts (black) and walnuts (black). (3.) The borers destroy locusts (black) entirely, and injure hickories very considerably.

IV.—OTHER DIFFICULTIES OBSERVED IN ATTEMPTS AT TREE-PLANTING.

BUREAU COUNTY.

(1.) Want of care and attention in the preparation of the land, planting, and cultivation of trees. It is as difficult to raise trees when cattle run at large as it is to raise crops of corn, wheat or oats.

CHRISTIAN COUNTY,

(1.) Want of time during crop season to give attention to the trees. Farmers get interested in the cultivation of their crops, and during the summer the weeds choke down the young trees.

COOK COUNTY.

(1.) Hard freezes in winter. (2.) Transplanting trees into a different soil from that in which they grew.

EDWARDS COUNTY.

(1.) Late spring frosts are a difficulty in the way of many farmers.

EFFINGHAM COUNTY.

(1.) Ignorance in the business of tree-planting and carelessness in the management. (2.) Extreme dry weather in the spring when trees are set out.

FORD COUNTY.

(1.) Want of means, lack of interest in planting trees, and failure to care for them afterward.

FRANKLIN COUNTY.

(1.) Dry weather in spring when the trees are first planted. (2.) Hot, dry spells in summer make it very difficult for young trees to live.

FULTON COUNTY.

(1.) If dry weather in summer follows the spring planting, it is very difficult to get young trees to live.

HANCOCK COUNTY.

(1.) Laziness and impatience. The people seem to lose sight of the fact that it takes time to raise a forest of trees.

JO DAVIESS COUNTY.

(1.) Dry, hot weather in spring and summer, the first two years after trees are planted.

KANE COUNTY.

(1.) Want of rain and too much wind are difficulties.

KANKAKEE COUNTY.

(1.) Carelessness in leaving the roots exposed too long to the weather.

KENDALL COUNTY.

(1.) Planting trees too far apart. (2.) Neglect is the greatest difficulty.

M'HENRY COUNTY.

(1.) Letting the stock run on the young trees. (2.) Planting trees out with too much top.

MARION COUNTY.

(1.) Planting too late in spring. If the season should be dry, the young trees die before taking root.

MARSHALL COUNTY.

(1.) Want of interest and care, and neglect of cultivation. (2.) General negligence.

SHELBY COUNTY.

(1.) Hot, dry weather in summer, and hard freezes in winter.

STEPHENSON COUNTY.

(1.) Want of interest. (2.) Dry, hot weather in July and August, the first and second years after transplanting.

TAZEWELL COUNTY.

(1.) Want of interest and being too impatient. Farmers seem to think because there is little probability of reaping any pecuniary benefit in their lifetime, there is no use in tree-planting.

WARREN COUNTY.

(1.) Laziness or "don't care." Some say it will not pay, and hence they decline to plant.

WAYNE COUNTY.

(1.) Want of means, and negligence after planting.

WHITESIDES COUNTY.

(1.) Watering too near the tree. There should be holes dug about two feet from the tree and water poured therein. (2.) Careless planting and lack of culture.

IOWA.

I.—THE KINDS OF TREES, IN ORDER OF PREFERENCE, FOUND TO HAVE BEEN GROWN SUCCESSFULLY.

ADAIR COUNTY.

(3.) Walnut (black), maple (soft), elm (white), cottonwood, catalpa, oak (burr), oak (red), ash (white), box-elder, poplar (Lombardy), elm (red), ash (green), hickory, willow (white), cherry, basswood (or linden), pine (white), pine (Scotch), balsam fir, butternut (or white walnut).

ADAMS COUNTY.

(5.) Maple (soft), cottonwood, walnut (black), box-elder, ash (white), poplar (Lombardy), catalpa, larch (European), cedar (red), elm (white), willow (white), butternut (or white walnut), willow (gray), pine (white), pine (Scotch), balsam fir, horse-chestnut (or buckeye).

APPANOOSE COUNTY.

(8.) Walnut (black), maple (soft), cottonwood, elm (white), oak (burr), hickory, oak (red), ash (white), oak (black), oak (white), chestnut, basswood (or linden), maple (hard), hackberry, locust (honey), butternut (or white walnut), box-elder, elm (red), poplar (silver), mulberry, pine (white), spruce (Norway), arbor-vitæ, poplar (Lombardy), willow (white), locust (black).

AUDUBON COUNTY.

(6.) Maple (soft), cottonwood, ash (white), walnut (black), box-elder, willow (white), elm (red), catalpa, poplar (Lombardy), elm (white), locust (honey), chestnut, pine (white), pine (Scotch), larch (European), spruce (Norway), balsam fir, arbor-vitæ, cedar (red), ash (green), oak (post), willow (red), willow (yellow), hickory, butternut (or white walnut), cherry, basswood (or linden), Kentucky coffee, pine (Austrian).

BOONE COUNTY.

(7.) Maple (soft), walnut (black), cottonwood, willow (white), box-elder, ash (white), butternut (or white walnut), locust (honey), poplar (Lombardy), basswood (or linden), pine (white), pine (Scotch), cedar (red), maple (hard), spruce (Norway), balsam fir, ash (green), elm (white), elm (red) catalpa, chestnut, arbor-vitæ, locust (black), cherry, oak (burr), oak (red), oak (white), ailanthus, Osage orange, birch, magnolia, Kentucky coffee, pine (Austrian), larch (European), larch (American).

BREMER COUNTY.

(3.) Cottonwood, maple (soft), walnut (black), ash (white), butternut (or white walnut), hickory, box-elder, willow (white), cherry, locust (honey), larch (European), elm (white), ash (green), Kentucky coffee, evergreens, chestnut, pine (white), catalpa, cedar (red), spruce (Norway).

BUCHANAN COUNTY.

(6.) Cottonwood, maple (soft), willow (white), walnut (black), elm (white), maple (hard), ash (white), butternut (or white walnut), box-elder, cherry, elm (red), pine (Austrian), spruce (Norway), pine (white), locust (black), locust (honey), basswood (or linden), ash (green), ash (mountain), tamarack.

BUENA VISTA COUNTY.

(2.) Cottonwood, maple (soft), maple (hard), ash (white), elm (white), box-elder, walnut (black), butternut (or white walnut), willow (white), catalpa.

CASS COUNTY.

(4.) Walnut (black), maple (soft), box-elder, pine (Scotch), maple (hard), cottonwood, elm (white), elm (red), catalpa, ash (white), butternut (or white walnut), chestnut, poplar (Lombardy), mulberry, willow (white), larch (European), spruce (Norway), balsam fir, cedar (red), arbor-vitæ, ash (black), basswood (or linden), ash (green), hemlock, pine (Austrian), locust (honey), horse-chestnut (or buckeye), oak (white), oak (black), hickory.

CEDAR COUNTY.

(3.) Catalpa, maple (soft), walnut (black), cedar (red), locust (honey), cherry, cottonwood, maple (hard), butternut (or white walnut), larch (European), elm (red), elm (white), box-elder, mulberry, oak (white), oak (burr), chestnut, oak (black), larch (American), pine (white), pine (Scotch), spruce (Norway), Osage orange, willow (yellow), willow (white), basswood (or linden).

CERRO GORDO COUNTY.

(4.) Willow (white), cottonwood, walnut (black), maple (soft), butternut (or white walnut), box-elder, poplar (Lombardy), elm (white), catalpa, willow (gray), balm of Gilead, larch (European), ash (white), ash (black), hickory, hackberry, balsam fir, evergreens, hemlock, pine (Austrian), elm (red), basswood (or linden), oak (red), birch.

CHEROKEE COUNTY.

(13.) Maple (soft), ash (white), cottonwood, box-elder, walnut (black), willow (white), elm (white), butternut (or white walnut), larch (European), elm (red), cedar (red), basswood (or linden), poplar (Lombardy), chestnut, oak (burr), hackberry, locust (honey), ash (black), evergreens, catalpa, hickory, balm of Gilead, oak (white), cherry.

CHICKASAW COUNTY.

(10.) Cottonwood, willow (white), maple (soft) walnut (black), ash, (white), butternut (or white walnut), larch, (European), balsam fir, poplar (Lombardy), elm (white), elm (red), box-elder, maple, (hard), hickory, larch (American), ash (black), spruce (Norway), pine (white), pine (Scotch), cedar (red), oak (red), oak (white), oak (black), locust (honey), balm of Gilead.

CLARKE COUNTY.

(5.) Maple (soft), walnut (black), cottonwood, box-elder, oak (white), ash (white), oak (burr), oak (black), oak (red), maple (hard), elm (red), poplar (Lombardy), catalpa, willow (white), locust (black), chestnut.

CLAY COUNTY.

(10.) Maple (soft), cottonwood, box-elder, walnut (black), willow (white), ash (white), elm (white), poplar (Lombardy), elm (red), hackberry, maple (hard), willow (yellow), mulberry, ash (green), butternut (or white walnut), larch (European), cedar (red), balm of Gilead, ash (black).

CLAYTON COUNTY.

(4.) Cottonwood, walnut (black), maple (soft), willow (white), box-elder, pine (white), butternut (or white walnut), maple (hard), oak (white), spruce (Norway), ash (white), cedar (red), balsam fir, oak (black), oak (red), basswood (or linden), hickory, elm (white), poplar (Lombardy), tamarack, pine (Austrian), hackberry, pine (Scotch), arbor-vitæ, cherry, elm (red), oak (burr), larch (European), ironwood.

DALLAS COUNTY.

(3.) Maple (soft), walnut (black), cottonwood, butternut (or white walnut), maple (hard), willow (white), ash (white), ash (green), catalpa, locust (honey), box-elder, pine (white), pine (Scotch), spruce (Norway), cedar (red), oak (white), oak (burr), elm (red), elm (white), cherry, larch (European), chestnut, mulberry, hackberry, sycamore, Osage orange.

DAVIS COUNTY.

(4.) Maple (soft), walnut (black), maple (hard), catalpa, elm (white), box-elder, hickory, butternut (or white walnut), ash (black), locust (black), locust (honey), ash (mountain), ash (white), oak (white), cedar (red), willow (white), pine (white), larch (European), spruce (Norway), arbor-vitæ, mulberry, Osage orange.

DECATUR COUNTY.

(8.) Maple (soft), walnut (black), willow (white), oak (white), oak (burr), cottonwood, ash (black), elm (red), box-elder, hickory, pine (Scotch), maple (hard), catalpa, cherry, elm (white), oak (black), ash (white), birch, locust (honey), willow (red), willow (yellow), basswood (or linden).

DELAWARE COUNTY.

(11.) Maple (soft), walnut (black), cottonwood, willow (white), maple (hard), poplar (Lombardy), box-elder, elm (red), elm (white), ash (white), butternut (or white walnut), spruce (Norway), pine (white), pine (Scotch), balsam fir, oak (white), oak (black), locust (honey), pine (Austrian), arbor-vitæ, cherry, hickory, hemlock, catalpa, hackberry, locust (black), cedar (red), basswood (or linden), oak (burr).

DES MOINES COUNTY.

(4.) Maple (soft), walnut (black), maple (hard), locust (black), box-elder, pine (white), pine (Scotch), cedar (red), ash (white), cottonwood, elm (red), elm (white), locust (honey), chestnut, arbor-vitæ, Osage orange, beech.

DICKINSON COUNTY.

(7.) Cottonwood, willow (white), ash (white), maple (soft), box-elder, walnut, (black), maple (hard), elm (white), oak (white), elm (red), ironwood, pine (white), spruce (Norway), poplar (Lombardy), oak (burr), basswood (or linden), willow (yellow).

FAYETTE COUNTY.

(9.) Willow (white), maple (soft), cottonwood, walnut (black), ash (white), box-elder, butternut (or white walnut), oak (burr), oak (white), elm (white), pine (white), larch (European), ash (black), cherry (wild), basswood (or linden), oak (red), oak (black), larch (American), spruce (Norway), arbor-vitæ, balsam fir, elm (red), catalpa, poplar (Lombardy), locust (honey), chestnut, maple (hard), hickory, ironwood, ash (mountain).

FLOYD COUNTY.

(4.) Maple (soft), cottonwood, box-elder, walnut (black), butternut (or white walnut), willow (white), elm (white), maple (hard), cedar (red), pine (white), poplar (Lombardy), pine (Austrian), catalpa, balsam fir, ash (mountain), balm of Gilead, elm (red), spruce (Norway).

FRANKLIN COUNTY.

(6.) Maple (soft), cottonwood, walnut (black), butternut (or white walnut), ash (white), box-elder, catalpa, maple (hard), hickory, poplar (Lombardy), larch (European), pine (Scotch), spruce (Norway), pine (white), pine (Austrian), balsam fir, arbor-vitæ, cedar (red), hemlock, balm of Gilead, willow (white), locust (honey), willow (yellow), elm (red), birch, elm (white), chestnut, locust (black), cherry, oak (red), oak (burr), larch (American), ash (mountain).

FRÉMONT COUNTY.

(5.) Maple (soft), box-elder, walnut (black), elm (red), cottonwood, elm (white), catalpa, ash (white), spruce (Norway), pine (Scotch), balsam fir, cedar (red), maple (hard), butternut (or white walnut), chestnut, willow (white), oak (white), locust (honey), larch (European), hickory, oak (burr), oak (red), oak (black), arbor-vitæ, willow (red).

GREENE COUNTY.

(4.) Maple (soft), cottonwood, willow (white), ash (white), poplar (Lombardy), box-elder, elm (red), willow (yellow), elm (white), hickory.

GRUNDY COUNTY.

(14.) Maple (soft), walnut (black), willow (white), ash (white), cottonwood, butternut (or white walnut), maple (hard), poplar (Lombardy), spruce (Norway), pine (white), balsam fir, larch (European), elm (red), elm (white) box-elder, locust (honey), oak (burr), oak (red), chestnut, hickory, cedar (red), pine (Austrian), catalpa, ash (black), willow (yellow), pine (Scotch), oak (black), locust (black), beech, ash (mountain), arbor-vitæ, basswood (or linden), cherry, larch (American), birch.

GUTHRIE COUNTY.

(3.) Maple (soft), walnut (black), cottonwood, willow (white), butternut (or white walnut), maple (hard), ash (white), locust (honey), box-elder, chestnut, elm (white), locust (black), willow (yellow), pine (Scotch), pine (Austrian), spruce (Norway), arbor-vitæ, cedar (red), balsam fir, larch (European), horse-chestnut (or buckeye).

HAMILTON COUNTY.

(7.) Maple (soft), cottonwood, willow (white), box-elder, walnut (black), ash (white), butternut (or white walnut), maple (hard), poplar (Lombardy), evergreens, elm (red), elm (white), sycamore, catalpa, mulberry.

HANCOCK COUNTY.

(6.) Willow (white), cottonwood, maple (soft), poplar (Lombardy), walnut (black), ash (white), box-elder, butternut (or white walnut), balm of Gilead, pine (Scotch), pine (white), pine (Austrian), elm (white), elm (red), larch (European), basswood (or linden), maple (hard).

HARDIN COUNTY.

(2.) Willow (white), maple (soft), cottonwood, walnut (black), larch (European), box-elder, catalpa, poplar (silver-leaf).

HARRISON COUNTY.

(17.) Cottonwood, box-elder, maple (soft), walnut (black), ash (white), elm (white), elm (red), willow (white), basswood (or linden) maple (hard), willow (red), hackberry, locust (honey), oak (burr), poplar (Lombardy), catalpa, Kentucky coffee, ironwood, ash (black), butternut (or white walnut), hickory, oak (white), mulberry, locust (black), cedar (red), larch (European), pine (Scotch), pine (white), balsam fir, arbor-vitæ, pine (Austrian), ailanthus, beech.

HENRY COUNTY.

(12.) Maple (soft), walnut (black), box-elder, willow (white), cottonwood, butternut (or white walnut), ash (white), maple (hard), locust (black), locust (honey), oak (white), oak (black), elm (white), Osage orange, ash (black), elm (red), chestnut, pine (white), pine (Scotch), cherry (wild), poplar (silver-leaf), cedar (red), hickory, mulberry, oak (red), oak (burr), basswood (or linden), oak (post), hackberry.

HOWARD COUNTY.

(3.) Maple (soft), cottonwood, maple (hard), willow (white), oak (burr), oak (white), box-elder, ash (white), walnut (black), ash (black), elm (white), elm (red), poplar (Lombardy), pine (white), balsam fir, spruce (Norway), poplar (silver-leaf), butternut (or white walnut), cherry, oak (red), oak (black), basswood (or linden,) birch, larch (European), locust (honey), cedar (red).

IDA COUNTY.

(3.) Cottonwood, maple (soft), walnut (black), willow (white), ash (white), box-elder, catalpa, elm (white), elm (red), butternut (or white walnut), pine (Scotch), spruce (Norway), pine (Austrian).

IOWA COUNTY.

(3.) Walnut (black), maple (soft), elm (red), cottonwood, willow (white), box-elder, butternut (or white walnut), maple (hard), cherry, elm (white), oak (burr), oak (white), oak (black), oak (red), hickory, locust (black), locust (honey), willow (yellow), ash (white), chestnut, catalpa, pine (white), spruce (Norway), cedar (red), basswood (or linden), larch (European), balsam fir, sycamore.

JACKSON COUNTY.

(2.) Walnut (black), maple (soft), maple (hard), balsam fir, butternut (or white walnut), pine (white), pine (Scotch), elm (white), spruce (Norway), basswood (or linden,) willow (white), elm (red), ash (white), box-elder, cottonwood, poplar (Lombardy).

JASPER COUNTY.

(6.) Maple (soft), walnut (black), maple (hard), cottonwood, box-elder, ash (white), elm (white), catalpa, poplar (Lombardy), willow (white), chestnut, locust (honey), locust (black), pine (Scotch), pine (white), spruce (Norway), pine (Austrian), larch (European), balsam fir, butternut (or white walnut), elm (red), birch, larch (American), cedar (red).

JEFFERSON COUNTY.

(7.) Maple (soft), walnut (black), cottonwood, elm (white), ash (white), maple (hard), butternut or white walnut, willow (white), elm (red), Osage orange, box-elder, oak (burr), oak (red), oak (white), birch, mulberry, basswood (or linden).

JOHNSON COUNTY.

(13.) Maple (soft), cottonwood, walnut (black), willow (white), butternut) or white walnut), larch (European), maple (hard), locut (honey), locust (black) box-elder, poplar (Lombardy), cherry, elm (white), pine (white), cedar (red), spruce (Norway), balsam fir, chestnut, catalpa, elm (red), birch, willow (yellow), poplar (silver-leaf), Osage orange, basswood (or linden), hickory, pine (Scotch), oak (burr), oak (white), hemlock.

KEOKUK COUNTY.

(5). Maple (soft), walnut (black), cottonwood, box-elder, butternut (or white walnut), elm (red), larch (European), locust (honey), oak (white), oak (burr), oak (red), oak (black), ash (white), catalpa, locust (black), chestnut, hickory, elm (white), basswood (or linden), birch, evergreens.

KOSSUTH COUNTY.

(6.) Maple (soft), cottonwood, walnut (black), willow (white), ash (white), elm (white), box-elder, poplar (Lombardy), butternut (or white walnut), elm (red), cherry, basswood (or linden,) maple (hard).

LEE COUNTY.

(7.) Walnut (black), maple (soft), locust (honey), elm (white), cottonwood, butternut (or white walnut), maple (hard), ash (white), catalpa, elm (red), locust (black), hickory, oak (white), oak (red), cherry, box-elder, sycamore, oak (black), cedar (red), hackberry, ailanthus, birch, willow (yellow), willow (white) oak (burr), ash (mountain), Kentucky coffee, Osage orange, magnolia, basswood (or linden), mulberry.

LINN COUNTY.

(7.) Maple (soft), walnut (black), butternut (or white walnut), ash (white), catalpa, cottonwood, box-elder, maple (hard), willow (white), elm (white), hickory, locust (honey), basswood (or linden), ash (green), ash (black), oak (burr), elm (red), pine (white), pine (Scotch), pine (Austrian), spruce (Norway), larch (European), larch (American), Osage orange, cedar (red), poplar (Lombardy), cherry, oak (white), chestnut.

LOUISA COUNTY.

(3.) Maple (soft), walnut (black), maple (hard) box-elder, willow (white), larch (European), pine (Scotch), cottonwood, spruce (Norway), willow (yellow), oak (white), locust (black), oak (burr), poplar (Lombardy), poplar (silver-leaf), Osage orange.

LUCAS COUNTY.

(3.) Walnut (black), butternut (or white walnut), basswood (or linden), cottonwood, maple (soft), maple (hard), oak (black), oak (white), elm (red), elm (white), oak (burr), hickory, poplar (Lombardy), willow (white), box-elder, locust (honey), horse chesnut (or buckeye), mulberry, ash (white), walnut (English), cherry, hackberry, Osage orange, pine (Scotch), pine (white), spruce (Norway), pine (Austrian), balsam fir, arbor-vitæ, hemlock, cedar (red), birch, larch (European).

LYON COUNTY.

(1.) Box-elder, ash (white), maple (soft), cottonwood, willow (white), elm (white), butternut (or white walnut), walnut (black).

MADISON COUNTY.

(2) Maple (soft), cottonwood, walnut (black), butternut (or white walnut), cherry, ash (white), maple (hard), oak (white), oak (red), oak (black), oak (burr), hickory, chestnut, evergreens.

MARSHALL COUNTY.

(8.) Maple (soft), walnut (black), butternut (or white walnut), ash (white), cottonwood, willow (white), elm (white), elm (red), box-elder, maple (hard), hickory, oak (burr), oak (red), oak (black), pine (white), spruce (Norway), pine (Austrian), balsam fir, larch (European), pine (Scotch), cedar (red), larch (American), birch, arbor vitæ, locust (honey), catalpa, willow (yellow), locust (black), hackberry, chestnut, basswood (or linden), ash (green), walnut (English), Kentucky coffee, ironwood, cherry, ash (mountain), hemlock, Osage orange.

MILLS COUNTY.

(8.) Ash (white), walnut (black), maple (soft), cottonwood, oak (burr), elm (white), willow (white), box-elder, butternut (or white walnut), elm (red), poplar (Lombardy), maple (hard), hickory, catalpa, willow (yellow), mulberry, oak (white), oak (black), hackberry, basswood (or linden), chestnut, Kentucky coffee, evergreens, spruce (Norway), pine (Scotch), sycamore.

MONONA COUNTY.

(8.) Walnut (black), cottonwood, box-elder, maple (soft), elm (red), ash (white), elm (white), willow (white), basswood (or linden), oak (burr), oak (white), mulberry, hickory, pine (Scotch), spruce (Norway), arbor-vitæ, pine (white), cedar (red), pine (Austrian), balsam fir, maple (hard), willow (red), willow (yellow), oak (black), ash (black), poplar (Lombardy), catalpa, Osage orange, birch, hemlock, chestnut, ironwood, hackberry, locust (honey), horse chestnut (or buckeye), larch (European), larch (American), sycamore, butternut (or white walnut), cherry.

MONROE COUNTY.

(10) Maple (soft), cottonwood, walnut (black), willow (white), elm (red), ash (white), hickory, oak (red), mulberry, locust (honey), spruce (Norway), pine (white), pine

(Scotch), larch (European), cedar (red), arbor-vitæ, oak (white), oak (black), oak (burr), cherry, Osage orange, willow (yellow), locust (black), box-elder, ash (green), ash (black), poplar (Lombardy), chestnut, basswood (or linden), balm of Gilead, pine (Austrian), larch (American), ash (mountain), catalpa, horse chestnut (or buckeye), butternut (or white walnut).

MONTGOMERY COUNTY.

(6.) Maple (soft), cottonwood, walnut (black), box-elder, willow (white), poplar (Lombardy), elm (red), ash (white), oak (white), chestnut, basswood (or linden), elm (white), locust (black), butternut (or white walnut), oak (burr), catalpa, locust (honey), Kentucky coffee, oak (black), hickory, cherry.

O'BRIEN COUNTY.

(8.) Maple (soft), walnut (black), box-elder, cottonwood, ash (white), willow (white), butternut (or white walnut), elm (white), oak (burr), hickory, elm (red), ash (mountain), cherry, ash (green), birch, poplar (Lombardy), Kentucky coffee, catalpa, oak (red), balm of Gilead, hackberry, pine (Scotch), locust (honey).

PLYMOUTH COUNTY.

(3.) Box-elder, cottonwood, ash (white), maple (soft), walnut (black), willow (white), elm (white), poplar (Lombardy), basswood (or linden), butternut (or white walnut), locust (black), locust (honey).

POCAHONTAS COUNTY.

(6.) Maple (soft), cottonwood, willow (white), ash (white), walnut (black), elm (white), butternut (or white walnut), elm (red), poplar (Lombardy), box-elder, ash (green), maple (hard), locust (honey), basswood (or linden), oak (burr), oak (black), oak (white), pine (Scotch), pine (white), spruce (Norway), cedar (red), balsam fir.

POTTAWATTAMIE COUNTY.

(4.) Walnut (black), cottonwood, larch (European), ash (white), maple (soft), elm (red), box-elder, butternut (or white walnut), chestnut, willow, (white), pine(Scotch), catalpa, cedar (red), cherry, ash (green), maple (hard), elm (white), oak (burr), oak (white), hickory, locust (honey), persimmon.

POWESHIEK COUNTY.

(4.) Maple (soft), cottonwood, willow (white), walnut (black), box-elder, ash (white), elm (red), pine (white), spruce (Norway), cedar (red), pine (Scotch), arbor-vitæ, larch (European), balsam fir, maple (hard), poplar (Lombardy), chestnut, oak (black), ash (black), butternut (or white walnut), cherry, hickory, locust (honey), oak (post), catalpa, oak (burr), oak (white).

RINGGOLD COUNTY.

(6.) Maple (soft), walnut (black), cottonwood, ash, (white), box-elder, willow (white), poplar (Lombardy), spruce (Norway), locust (honey), elm (white), elm (red), pine (white), pine (Scotch), arbor-vitæ), cedar (red), butternut (or white walnut), locust (black), mulberry, oak (burr), hickory, basswood (or linden), hackberry.

SAC COUNTY.

(8.) Maple (soft), ash (white), cottonwood, box-elder, walnut (black), catalpa, elm (red), elm (white), willow (white), locust (honey), pine (Scotch), spruce (Norway), pine (Austria), poplar (Lombardy), butternut (or white walnut), oak (black), oak (burr), oak (red), hackberry, basswood (or linden), pine (white), balsam fir, ash (green), chestnut, ironwood, willow (yellow), cherry, birch, mulberry, ash (black), cedar (red), hickory, larch (European), oak (post), locust (black), Kentucky coffee.

SCOTT COUNTY.

(6.) Maple (soft), walnut (black), cottonwood, ash, (white), box-elder, pine (white), willow (white), chestnut, locust (honey), maple (hard), elm (white), elm (red), butternut (or white walnut), cedar (red), spruce (Norway), basswood, or linden, locust (black), cherry, pine (Scotch), hickory, oak (burr), oak (black), oak (white), oak (red), ash (black), willow (yellow), poplar (Lombardy), Kentucky coffee, balm of Gilead.

SHELBY COUNTY.

(1.) Cottonwood, poplar (Lombardy), walnut (black), maple (soft), willow (white), box-elder.

SIOUX COUNTY.

(4.) Maple (soft), walnut (black), box-elder, cottonwood, willow (white), ash (white), butternut (or white walnut), maple (hard), pine (Scotch), ash (black), ash (mountain), tamarack, elm (white), larch (European), cedar (red), balm of Gilead, mulberry, catalpa, poplar (Lombardy), elm (red), pine (Austrian), arbor-vitæ. spruce, (Norway), pine (white), balsam fir.

TAMA COUNTY.

(11.) Maple (soft), walnut (black), willow (white), cottonwood, ash (white), box-elder, maple (hard), pine (Scotch), butternut (or white walnut), hickory, locust (honey), poplar (Lombardy), oak (red), oak (burr), oak (white), spruce (Norway), pine (white), larch (European), elm (red), elm (white), catalpa, basswood (or linden), chestnut, poplar (silver-leaf), locust (black), balsam fir, cherry, ash (green), mulberry, arbor-vitæ, hackberry, sycamore.

TAYLOR COUNTY.

(6.) Maple (soft), cottonwood, walnut (black), willow (white), box-elder, butternut (or white walnut), poplar (Lombardy). elm (white), elm (red), ash (white), maple (hard), poplar (silver-leaf), willow (yellow), locust (black), pine (white), catalpa.

UNION COUNTY.

(6.) Willow (white), maple (soft), walnut (black), box-elder, cottonwood, elm (white), ash (black), ash (white), catalpa, elm (red), oak (burr), locust (honey), oak (white), willow (yellow), hickory, oak (black), poplar (Lombardy), maple (hard), Osage orange, cherry, hackberry, basswood (or linden), pine (Scotch), pine (Austrian), poplar (silver-leaf).

WAPELLO COUNTY.

(2.) Maple (soft), cottonwood, oak (white), elm (white), hackberry, mulberry, locust (honey).

WARREN COUNTY.

(6.) Maple (soft), walnut (black), cottonwood, box-elder, maple (hard), willow (white), elm (white), pine (white), locust (black), pine (Scotch), butternut (or white walnut), ash (white), pine (Austrian), spruce (Norway), arbor-vitæ, larch (European), ash (black), oak (burr), locust (honey), oak (white), oak (black), catalpa, basswood (or linden), elm (red), hickory.

WASHINGTON COUNTY.

(7) Maple (soft), walnut (black), cottonwood, willow (white), box-elder, maple (hard), ash (white), butternut (or white walnut), elm (red), poplar (Lombardy), oak (white), oak (burr), oak (red), locust (black), spruce (Norway), pine (white), pine (Scotch), larch (European), elm (white), ash (black), catalpa, Osage orange, pine (Austrian), basswood (or linden), balsam fir, hickory, larch (American), sycamore.

WAYNE COUNTY.

(3.) Maple (soft), walnut (black), cottonwood, ash (white), willow (white) oak (white), oak (burr), elm (white), elm (red), catalpa, hickory, basswood (or linden)

maple (hard), willow (yellow), locust (black), spruce (Norway), pine (white) pine (Scotch), cedar (red), mulberry, oak (black), locust (honey), hackberry, box-elder, cherry.

WINNEBAGO COUNTY.

(3.) Cottonwood, walnut (black), willow (white), maple (soft), ash (white), poplar (Lombardy), box-elder, cedar (red), butternut (or white walnut), oak (burr), locust (honey), oak (black), pine (white), pine (Scotch), balsam fir, spruce (Norway), maple (hard), cherry.

WINNESHIEK COUNTY.

(13.) Cottonwood, maple (soft), walnut (black), butternut (or white walnut), poplar (Lombardy), willow (white), maple (hard), elm (white), oak (burr), oak (red), ash (white), box-elder, oak (white), oak (black), basswood (or linden), hickory, pine (white), pine (Scotch), balsam, fir, spruce (Norway), poplar (silver-leaf), elm (red), ash (black), balm of Gilead, willow (yellow), cedar (red), locust (honey), mulberry.

WRIGHT COUNTY.

(13.) Maple (soft), willow (white), cottonwood, walnut (black), poplar (Lombardy), box-elder, butternut (or white walnut), ash (white), elm (white), maple (hard), oak (burr), ash (black), basswood (or linden), catalpa, elm (red), oak (red), willow (yellow), larch (European), hickory, birch, spruce (Norway), balsam fir, oak (white), oak (black), cedar (red), locust (honey), cherry.

SUMMARY.

Fifty-six kinds of trees are reported from the State at large. In order of preference, the leading varieties are as follows:

(1) Maple (soft), (2) walnut (black), (3) cottonwood, (4) willow (white), (5) box-elder, (6) ash (white), (7) butternut (or white walnut), (8) elm (white), (9) maple (hard), (10) elm (red), (11) poplar (Lombardy), (12) locust (honey), (13) catalpa, (14) pine (Scotch), (15) oak (burr), (16) pine (white), (17) oak (white), (18) hickory, (19) larch (European), (20) spruce (Norway), (21) basswood (or linden), (22) cedar (red), (23) oak (red), (24) locust (black), (25) oak (black), (26) chestnut, (27) cherry.

II.—THE KINDS TRIED WHICH PROVED UNSUCCESSFUL.

ADAIR COUNTY.

(1.) Locusts (black) are infested with borers or grubs in the trunk which kill them. Locusts (honey) are sometimes attacked by borers. They also die during hard winters. Ailanthus cannot stand the winter freezes.

ADAMS COUNTY.

(1.) Locusts (black and yellow) are killed by borers. It is useless to attempt to raise them. The ailanthus is winter-killed.

APPANOOSE COUNTY.

(3.) Locusts (black and honey) are attacked by borers and other insects which completely kill them, particularly the black. Chestnuts are not adapted to the soil and climate. Poplars (Lombardy) grow luxuriantly for a few years, then begin to wither at the top, and very soon the whole tree dies.

AUDUBON COUNTY.

(3.) Buckeye (or horse-chestnut) and beech cannot stand hard winter freezes. Evergreens of all kind fail from supposed climatic causes. Chestnuts are not suited to the soil, and locusts fail on account of borers.

BOONE COUNTY.

(2.) Locusts (black) are killed by borers. Poplar (Lombardy) is short-lived. Tulip is winter-killed, and holly will not grow.

BREMER COUNTY.

(2.) Poplars (Lombardy) are short-lived. Locusts (black) are killed by borers; ailanthus, buckeye, or horse-chestnut, and the evergreens are not suited to soil and climate.

BUCHANAN COUNTY.

(2.) Osage orange is killed by dry weather in the fall and hard freezes in winter. Locusts (black) are killed by borers; poplars (Lombardy) are short-lived, and chestnut and beech die from climatic causes.

BUENA VISTA COUNTY.

(1.) Poplars (Lombardy) are short-lived; they seem to grow and thrive well for ten or fifteen years, then begin to decay at the top, and soon the whole tree dies. The evergreens are not suited to soil or climate.

CASS COUNTY.

(1.) Beech, chestnuts, and one species of catalpa, are not hardy enough, when young, to stand the hard winters.

CEDAR COUNTY.

(1.) Locusts (black) are so completely devastated by the borers that but few are planted.

CERRO GORDO COUNTY.

(3.) Poplars (Lombardy) are short-lived; catalpa grows finely, but dies in winter, and locusts (black) are killed by borers

CHEROKEE COUNTY.

(9.) Poplars (Lombardy) are short-lived and killed by winter. Chestnuts, balm of Gilead, willows (yellow), cottonwoods, walnuts (black), and Osage orange, all perish more or less from hard freezes. Locusts are killed by borers; pines (white), balsam-fir and evergreens generally, are not suited to soil and climate. The oaks and hickories will not bear transplanting.

CHICKASAW COUNTY.

(5.) Locusts (black) are killed by borers and hard freezes; poplars (Lombardy) are short-lived; balm of Gilead is winter-killed; willows (yellow), and beech, not hardy, die in winter.

CLARKE COUNTY.

(1.) Locusts (black) have, up to a few years back, been well thought of. The trees were thrifty, and the wood fine, but the borers have almost completely destroyed them.

CLAY COUNTY.

(5.) Balm of Gilead cannot stand the hard winter freezes; poplars (Lombardy) are short-lived, and locusts (black) killed by borers.

CLAYTON COUNTY.

(4.) Locusts (black) are destroyed by borers; horse-chestnut (or buckeye), balm of Gilead, and locusts (honey), are subject to winter-kill.

DALLAS COUNTY.

(2.) Locusts (black) are killed by borers cutting into the wood; oaks and chestnuts do not seem to be suited to the soil. They die from some cause.

DAVIS COUNTY.

(2.) Locusts (black) are subject to the attacks of borers, and poplars (Lombardy) live only a few years. Some disease or insect attacks them in the top branches, from which they soon perish.

DECATUR COUNTY.

(4.) Catalpas and balm of Gilead die in winter; spruces and firs fail in summer, the hot sun kills them; locusts (black) are killed by borers; poplars (Lombardy) are short-lived, being subject to winter-kill; chestnuts are not suited to the soil.

DELAWARE COUNTY.

(7.) Locusts (black and yellow) are destroyed by borers; poplars (Lombardy) are short-lived; Osage orange, spruces, firs, hemlocks, chestnuts, oaks, and ash fail from extremes of heat and cold; maples (soft) are tender, and easily split by winds.

DICKINSON COUNTY.

(3.) Pines and all the evergreen family die in hot, dry weather; poplars (Lombardy) are short-lived, and locusts (black) are killed by borers.

FAYETTE COUNTY.

(6.) Poplars (Lombardy) are short-lived; Osage orange, chestnuts and cottonwoods die in winter; locusts are killed by borers.

FLOYD COUNTY.

(2.) Poplars (Lombardy) are short-lived, and cottonwoods suffer much from borers.

FRANKLIN COUNTY.

(4.) Poplars (Lombardy) live but a few years; they are considered worthless; locusts (black) are destroyed by borers, and hickories and Osage orange die from hard freezes.

FREMONT COUNTY.

(2.) Locusts (yellow) are killed by borers; maples (hard), beech, and chestnuts are not suited to the soil; larches cannot stand hot summers.

GREENE COUNTY.

(2.) Poplar (Lombardy) is short-lived; locusts (honey) are winter-killed.

GRUNDY COUNTY.

(8.) Butternut (or white walnut) cannot stand hot, dry summer weather; locusts (black and yellow) are destroyed by borers; poplar (Lombardy) is short-lived, and catalpas (soft), spruces and Osage orange are not hardy enough to stand the winters.

GUTHRIE COUNTY.

(3.) Poplar (Lombardy) is short-lived; locusts (black) are killed by borers, and catalpas die in winter.

HAMILTON COUNTY.

(3.) Poplars (Lombardy) are winter-killed and otherwise short-lived; the locust family is damaged by borers, and oaks are not successful from causes unknown.

HARDIN COUNTY.

(1.) Poplars (Lombardy) are short-lived; balm of Gilead is not hardy and dies in winter. Chestnuts are not suited to soil and climate.

HARRISON COUNTY.

(10.) Pines, oaks, chestnuts, hickories, poplars (Lombardy), locusts, spruces, maples, elms (red), beech, ailanthus, Osage orange and the evergreens have all failed on account of heat in summer and cold in winter.

HENRY COUNTY.

(6.) Locusts (black) are destroyed by the borers; chestnuts and locusts (honey) are not suited to soil and climate, and poplars (Lombardy) are short-lived.

HOWARD COUNTY.

(2.) Chestnuts, buckeye (or horse-chestnut), and Osage orange cannot stand the hard freezes in winter; locusts (yellow) are killed by borers; hemlocks suffer from heat and drought, and willows (yellow) from climatic causes. Poplars (Lombardy) are short-lived.

IDA COUNTY.

(1.) Locusts are almost completely annihilated by borers. The ravages of these pests are so destructive to this particular species of trees that planting them is waste of time and money.

IOWA COUNTY.

(2.) Locusts (black) are destroyed by borers; poplars (Lombardy) are very short-lived, and chestnuts die in winter.

JACKSON COUNTY.

(2.) Poplars (Lombardy) soon die, and are of very little value. Cottonwoods and willows (white) perish during hard winter freezes.

JASPER COUNTY.

(1.) Locusts (black) are almost completely destroyed by borers.

JEFFERSON COUNTY.

(4.) Locusts (black) are killed by borers. Poplars (Lombardy) are winter-killed, and naturally short-lived.

JOHNSON COUNTY.

(6.) Locusts (black and yellow) are killed by borers, and box-elder dies in severe winter weather.

KEOKUK COUNTY.

(4.) Locusts (black) are destroyed by borers. Poplars (Lombardy) and cottonwoods die out in a few years.

KOSSUTH COUNTY.

(1.) Locusts (black and honey) are so badly killed by borers it is almost useless to plant them, especially the black. Osage orange is winter-killed, and evergreens of all kinds fail. The soil and climate are not suitable.

LEE COUNTY.

(3.) Ash (white) and locusts are killed by severe winter, and also destroyed by borers. Beech, birch, the maples, cottonwoods, pecans, sycamores, oaks, basswood (or lindens), and persimmons all fail on account of extremes of heat and cold.

LINN COUNTY.

(4.) Poplars (Lombardy) are short-lived. They grow well, but die out in a few years. Chestnuts are not suited to soil nor climate, and locusts (black) are killed by borers.

LOUISA COUNTY.

(2.) Larch (European) dies very soon. It cannot stand the hot, dry weather. Locusts (black) are killed by borers.

LUCAS COUNTY.

(3.) Poplars (Lombardy) are short-lived; beech is not suited to soil and climate, and locusts (black) are killed by borers.

LYON COUNTY.

(1.) The maples, catalpas, tamarack, cedar (white), balsam fir, chestnuts, locusts, pines, oaks, poplars, walnuts and balm of Gilead have all failed. The causes of failure are unknown, but are attributed to the influences of climate and nature of the soil.

MARSHALL COUNTY.

(4.) Locusts (black and yellow) and the hickories are destroyed by borers.

MILLS COUNTY.

(5.) Maples (hard and soft) do not grow to perfection; the cause is not known. Locusts (black and honey) are killed by borers; poplars (Lombardy) are short-lived, and larches (European) are not suited to soil and climate.

MONONA COUNTY.

(4.) Butternuts (or white walnut) and chestnuts are killed by winter. Osage orange cannot stand hard freezes; locusts (yellow) are killed by borers; the evergreens are not suited to the soil and climate; and buckeye (or horse-chestnut) suffers from severe winters.

MONROE COUNTY.

(5.) Locusts are killed by borers; persimmons, chestnuts, hemlocks, spruces and pines are not suited to soil and climate, and poplars (Lombardy) are short-lived. Magnolias are not hardy; they die in winter, and cottonwoods are killed by borers and hard winter freezes.

MONTGOMERY COUNTY.

(2.) The evergreens are almost a total failure; about one in five will live, but they do not thrive. The cause is attributable to soil and climate. Poplars (Lombardy) grow swiftly for a few years, but are short-lived.

O'BRIEN COUNTY.

(8.) Poplars and chestnuts are winter-killed; maple (hard), persimmon, pines and elms do not seem to be suited to soil and climate, and catalpas are not hardy enough to stand the winter cold.

PLYMOUTH COUNTY.

(3.) Poplars (Lombardy) are killed in winter and generally short-lived; Osage orange also suffers from cold, and the evergreens are not suited to climate and soil.

POCAHONTAS COUNTY.

(6.) Chestnuts, Osage orange, and willow (yellow) cannot stand the hard winters. Evergreens of all kinds are unsuited to soil and climate; poplars (Lombardy) are killed by winter and otherwise short-lived, and locusts are destroyed by borers.

POTTAWATTAMIE COUNTY.

(1.) Poplars (Lombardy) are short-lived, and locusts (black) are killed by borers.

POWESHIEK COUNTY

(3.) Evergreens do not succeed; they die out during the summer. Butternuts (or white walnut) and chestnuts are killed by winter, and locusts (black and honey) perish from the attacks of borers.

RINGGOLD COUNTY.

(3.) Locusts grow rapidly, but the borers attack them and almost all die.

SAC COUNTY.

(5.) Evergreens of all kinds, except Scotch and Austrian pines, are unsuited to soil and climate. Ash (white) is killed by blight; poplars, hickories, chestnuts and Osage orange die in winter, and locusts are killed by borers.

SCOTT COUNTY.

(4.) Locusts (black) are killed by borers; poplars (Lombardy) are short-lived; catalpas die in winter, and mulberry is not suited to climate.

SIOUX COUNTY.

(1.) Poplars (Lombardy) seem to thrive and do well for ten or fifteen years, when they begin to decay in the top branches and very soon the tree dies.

STORY COUNTY.

(1.) Juniper is a failure, but the cause is not known, unless the soil is unsuitable.

TAMA COUNTY.

(6.) Poplar (Lombardy) is short-lived; locusts (black and yellow) are killed by borers; larches, ailanthus, Osage orange, sassafras, balm of Gilead, buckeye (or horse-chestnut), and beech, are not adapted to soil and climate. Most of them die from the effects of frost.

TAYLOR COUNTY.

(2.) Locusts (black) are destroyed by borers, which also do great injury to maples (soft). Poplars (Lombardy) are short-lived, and balm of Gilead is winter-killed.

UNION COUNTY.

(5.) Butternut (or white walnut) and catalpa are not hardy and die in winter. Locusts (black and yellow) are killed by borers. The evergreens and beech are not suited to climate, and poplars (Lombardy) are short-lived. They are almost worthless.

WAPELLO COUNTY.

(1.) Maples (hard), hickories, and oaks, are not successful. The soil and climate are unsuitable.

WARREN COUNTY.

(5.) Locusts (black) are destroyed by borers; chestnuts are not suited to the soil and climate, and juniper is not hardy. It cannot stand the climate.

WASHINGTON COUNTY.

(3.) Poplars (Lombardy) are short-lived; they die in winter. Locusts are destroyed by borers.

WAYNE COUNTY.

(2.) Locusts (black) are badly killed by borers, and chestnuts are not suited to soil and climate.

WINNEBAGO COUNTY.

(2.) Locusts (black) are winter-killed, and also subject to attacks of borers. Locust (yellow) suffers from like causes. Chestnuts are not hardy, being subject to winter-kill.

WINNESHIEK COUNTY.

(6.) Locusts (black and honey) are subject to winter-kill and destruction by borers. Poplars (Lombardy) are short-lived, and larches and tamarack are unsuited to the climate.

WRIGHT COUNTY.

(5.) Poplars (Lombardy) die out in a few years; the cause is not known. The decay begins in the top and soon ends the life of the tree. Cottonwoods are affected by borers just above the ground; maples (hard) suffer from blight, and pines (white) are killed by gophers eating the roots.

SUMMARY.

Forty-two kinds of trees are mentioned as having been tried which did not prove successful. The following is the list and the number of times each is stated in the report: Locust (black), 56; poplar (Lombardy), 47; chestnut, 26; cottonwood, 13; evergreens, 13; Osage orange, 13; beech, 11; locust (yellow), 11; balm of Gilead, 9; catalpa, 9; locust (honey), 8; maple (hard), 8; oaks, 8; pines, 7; buckeye (or horse-chestnut), 6; hickory, 6; maple (soft), 6; ailanthus, 5; larch, 5; spruce, 5; butternut (or white walnut), 4; ash (white), 3; hemlock, 3; persimmon, 3; willow (yellow), 3; juniper, 2; elm (red), 2; tamarack, 2; walnut (black), 2; and birch, box-elder, holly, magnolia, mulberry, basswood (or linden), sassafras, sycamore, tulip, pecan, willow (white), each once.

III.—THE INJURIES NOTICED TO HAVE OCCURRED FROM INSECTS OR OTHER CAUSES.

ADAIR COUNTY.

(1.) The flat-head borers kill the locusts and often injure maples and elms the first year after transplanting, but not after. Green worms in great numbers frequently make their appearance and completely destroy the foliage of maples (soft). Webworms injure elms, and green worms eat the willow leaves.

ADAMS COUNTY.

(1.) Severe winters injure young trees more than any other cause. (2.) Worms, or borers, injure the maples by cutting into the wood, which checks the growth of the trees, causing many to die, and caterpillars very often strip the leaves from trees. Gophers are also very destructive. High winds and drought are very injurious. (3.) Maples are injured by a green worm, and willows (white) are often stripped of their leaves by white worms.

APPANOOSE COUNTY.

(1.) The tree borers and hard winters are very damaging. (2.) Caterpillars are likewise injurious.

AUDUBON COUNTY.

(1.) White worms sometimes infest willows, and caterpillars injure maples. Tent-caterpillars injure cherry and hickory. The "black gnat" injures elms (white). Hard, cold winters are damaging. (2.) Gophers injure trees by eating the roots. (3.) The borers attack locusts, and large numbers die from the effects of these pests. (4.) A white grub, with yellow head, injures maples (soft); they bore into the trunk from the ground to the limbs.

BOONE COUNTY.

(1.) Caterpillars eat the leaves of willows, but no material injury is perceptible. Gophers sometimes do considerable injury. (2.) Worms injure the willows. (3.) The borers are very destructive to the entire locust family, and also injure poplars. (4.) A borer works on the maples (soft) under the bark, and also damages the ash (white) to some extent.

BREMER COUNTY.

(1.) Web-worms have done considerable injury to the cherry. Cottonwoods are sometimes affected by sun-scald on the south of the trunk.

BUCHANAN COUNTY.

(1.) Cold winters are injurious to young trees. (2.) Worms eat off the foliage, and borers cut the wood, causing damage. (3.) Hard winds are injurious; they shake and break young trees.

CASS COUNTY.

(1.) Worms eat the leaves and borers cut the wood of maples (soft), all of which is injurious. Hard freezes in winter are also damaging.

CEDAR COUNTY.

(1.) Borers kill the locusts, almost completely destroying them in some sections. (2.) Insects infest walnut (black), cherry, and ash (white), and retard the growth of the trees. Hard freezes in winter injure catalpa and Osage orange.

CERRO GORDO COUNTY.

(1.) Large green worms injure willows. (2.) Borers attack the ash (white).

CHEROKEE COUNTY.

(1.) Grasshoppers injure maples by eating the leaves and twigs. (2.) Grasshoppers injure the larches, poplars, and several other trees. (3.) The borers are the worst enemies to trees, in the way of insects, but prairie fires and unrestrained stock do the most damage. (4.) Grasshoppers and borers are injurious to the willows and ash. (5.) Yellow and striped worms attack willows, and large green worms injure cotton-woods.

CHICKASAW COUNTY.

(1.) Yellow caterpillars injure maples (soft). (2.) Borers injure cottonwoods, and so does "sun scald." This causes the bark to come off. (3.) Hard, cold winters are destructive generally. (4.) Borers injure box-elders. (5.) A species of lice infest the willows (white), and retard their growth.

CLARKE COUNTY.

(1.) Worms eat the leaves of maples and cottonwoods, and web-worms sometimes injure hickories and oaks. (2.) Borers are very destructive to locusts, and worms attack maples (soft).

CLAY COUNTY.

(1.) Grasshoppers in certain seasons do great damage to trees. (2.) Worms do some injury by eating off the leaves. Borers attack locusts, and the tobacco worm injures the willows. (3.) Grasshoppers injure poplars. (4.) Gophers affect maples (soft) by cutting the roots. (5.) "Sun-scald" injures cottonwoods. (6.) Borers attack the ash (white). The "*cecropia moth*" eats the foliage of maples and box-elders, and grasshoppers injure the willows, poplars, and cottonwoods. (7.) The borers and June bugs do great damage to ash (white).

CLAYTON COUNTY.

(1.) Borers kill locusts. (2.) Caterpillars injure walnuts (black), by eating the leaves. (3.) Leaf-curlers in maples (soft) and cotton-woods and borers in locusts are the only insects that do any injury to trees.

DALLAS COUNTY.

(1.) Borers in the trunks of trees and gophers eating the roots do great damage to young trees.

DAVIS COUNTY.

(1.) The borers cut into the locusts just above the ground and cause great destruction.

DECATUR COUNTY.

(1.) Borers injure maples by cutting the wood, and worms retard the growth by eating the leaves. (2.) Brown caterpillars injure walnuts by eating the leaves. (3.) Borers attack locusts and caterpillars injure maples. (4.) The borers affect the locusts (black) so badly that their planting has been almost abandoned. (5.) Borers in locusts and the green measure-worms on the maples cause some injury.

DELAWARE COUNTY.

(1.) Borers injure maples (soft) very badly. (2.) Hard freezes in winter and droughts in summer are very destructive to trees. (3.) Borers injure poplars. (4.) The borers and hard winds are very injurious.

DES MOINES COUNTY.

(1.) Borers are very destructive to locusts; they cut the trunk from the ground to the limbs.

DICKINSON COUNTY.

(1.) Grasshoppers have done considerable damage to young trees by eating the leaves and twigs. (2.) Butterflies injure box-elders and maples (soft) in September. (3.) Caterpillars cause some trouble. (4.) Caterpillars injure willows and borers do considerable damage to all kinds of trees.

FAYETTE COUNTY.

(1.) A grayish caterpillar injures walnuts. (2.) Worms injure willows. (3.) Borers injure trees badly.

FLOYD COUNTY.

(1.) Worms denude willows (white) of leaves. (2.) The borers are very injurious to trees; walnuts, cherry, and ash are injured by caterpillars. (3.) Gophers do the greatest damage by cutting the roots of trees.

FRANKLIN COUNTY.

(1.) Caterpillars injure willows (gray).

FREMONT COUNTY.

(1.) The borers do great injury. (2.) Worms are injurious to maples and walnuts. (3.) Worms do some harm to maples (soft). (4.) Borers kill locusts.

GREENE COUNTY.

(1.) Large white worms eat the leaves of willows (white) every year. (2.) Borers kill locusts.

GRUNDY COUNTY.

(1.) The web-worms do some injury to the walnut family, though it is not very serious. (2.) Gray worms on willows and caterpillars on maples (soft) are somewhat destructive. The borers kill locusts (black). (3.) Borers and grubs injure locusts and poplars. (4.) The flat caterpillar injures walnuts.

GUTHRIE COUNTY.

(1.) Worms eat the leaves of willows, which injures them, but not seriously.

HAMILTON COUNTY.

(1.) The borers destroy locusts and ash. (2.) Hard freezes in winter do great injury.

HANCOCK COUNTY.

(1.) The gophers cut the roots of trees badly, especially poplars, causing large numbers to die.

HARRISON COUNTY.

(1.) Borers kill locusts. (2.) Gophers cut the roots of maples (soft), causing them to die. (3.) Grasshoppers and worms have done some damage. (4.) Borers work into the trunk of cottonwoods, and they perish in large numbers. (5.) Large worms eat the sappy parts of the trunks of cottonwoods, ash, locusts (black), and box-elders, which causes great destruction, and caterpillars injure walnuts to some extent. (6.) Borers attack locusts. (7.) Borers are the only insects that injure trees. (8.) The tent caterpillar injures walnuts. (9.) Borers kill cottonwoods.

HENRY COUNTY.

(1.) Borers are the only insects to contend against, but they do considerable damage. (2.) Stock running at large is very injurious to trees. (3.) Green worms eat the leaves from maples. (4.) Borers kill locusts. (5.) Caterpillars eat the leaves of the walnut.

HOWARD COUNTY.

(1.) Borers are destructive to locusts (yellow). (2.) Blight affects poplars (Lombardy) very badly. (3.) Caterpillars injure willows by eating the leaves.

IDA COUNTY.

(1.) Dry winds in the spring of the year are very injurious.

IOWA COUNTY.

(1.) Borers injure maples, and caterpillars do some injury to willows by eating the foliage. (2.) The borers kill locusts (black). Beetles injure the cottonwoods, and caterpillars eat the leaves of oaks, maples (soft), and other trees, but no perceptible injury arises therefrom.

JASPER COUNTY.

(1.) The borers are very destructive to locusts (black).

JEFFERSON COUNTY.

(1.) Rabbits do considerable damage to young trees by eating off the bark in winter. (2.) The borers kill locusts. (3.) The common borers do the most injury.

JOHNSON COUNTY.

(1.) The borers destroy locusts. (2.) A species of caterpillar eats the foliage of willows and walnuts. (3.) The borers are so destructive to locusts (black), it is almost useless to plant them. (4.) The borers kill locusts (yellow), and hard freezes are generally injurious. (5.) The borers injure locusts and maples (soft).

KEOKUK COUNTY.

(1.) Caterpillars infest walnuts (black), and eat the leaves. (2.) The borers kill the locusts, and "sun-scald" is very damaging to cottonwoods; it affects the trees on the south and southwest sides of the trunk, from which many die.

KOSSUTH COUNTY.

(1.) Worms on willows cause some injury, and "sun-scald" kills a great many cottonwoods. (2.) Borers kill locusts. (3.) Gophers kill the poplars (Lombardy) by eating the roots. (4.) Grasshoppers do considerable injury.

LEE COUNTY.

(1.) The borers injure cottonwoods and oaks. Basswood (or lindens) and persimmons are sometimes injured by borers. (2.) Borers sometimes kill the elms and willows (white). (3.) The borers kill locusts (black). (4.) Caterpillars do some injury. (5.) Borers sometimes injure oaks (red).

LINN COUNTY.

(1.) The borers injure maples (soft), and worms or caterpillars attack the walnuts and willows.

LOUISA COUNTY.

(1.) The borers are very destructive to locusts (black).

LUCAS COUNTY.

(1.) Borers completely destroy locusts (black).

LYON COUNTY.

(1.) Grasshoppers have done much injury by eating the leaves and twigs of young trees.

MARION COUNTY.

(1.) The borers kill locusts (black) so thoroughly, it is almost useless to plant them.

MARSHALL COUNTY.

(1.) Worms and caterpillars eat the leaves. (2.) Bugs and hail-storms do great injury. (3.) Borers injure locusts and hickories, and worms attack maples (soft), walnuts, and basswood (or lindens). (4.) Borers injure maples (soft), and worms infest walnuts (black).

MILLS COUNTY.

(1.) Worms sometimes injure maples (soft). (2.) The borers attack locusts and hickories, and blight injures the oaks. It is similar to the "pear-blight," and occurs in August and September. (3.) Worms injure maples.

MONONA COUNTY.

(1.) Gophers gnaw the roots, and grasshoppers cut the twigs; both are injurious. (2.) Caterpillars do some injury to cottonwoods. (3.) The borers kill locusts.

MONROE COUNTY.

(1.) The locusts (black) are destroyed by borers, and worms do some injury to walnuts. (2.) Borers injure locusts. (3.) Wind and sleet destroy trees. (4.) Storms and sleet do considerable damage, and stock running at large injure trees very much.

MONTGOMERY COUNTY.

(1.) Caterpillars eat the leaves of maples, but do no material injury.

O'BRIEN COUNTY.

(1.) Gophers injure locusts (honey). (2.) Black caterpillars attack willows. (3.) The borers injure ash (white) and maples (soft), and "sun-blight" or "sun-scald" kills cottonwoods. Grasshoppers also do some injury.

PLYMOUTH COUNTY.

(1.) Grasshoppers injure trees by eating the leaves and sucking the sap.

POCAHONTAS COUNTY.

(1.) Caterpillars do some injury to willows (white).

POTTAWATTAMIE COUNTY.

(1.) Borers kill locusts and cottonwoods.

POWESHIEK COUNTY.

(1.) Borers are very destructive to locusts (black). In many instances they are completely killed.

RINGGOLD COUNTY.

(1.) Borers kill the locusts (black) and worms do some injury to maples (soft) by eating the leaves.

SAC COUNTY.

(1.) Borers, gophers and grasshoppers are all injurious. Worms hurt maples and cottonwoods.

SCOTT COUNTY.

(1.) Gophers, mice and prairie fires are very injurious to trees.

SIOUX COUNTY.

(1.) Worms are sometimes injurious to box elders and maples (soft).

TAMA COUNTY.

(1.) Borers in the locusts are the only trouble. (2.) Gophers and caterpillars are injurious.

TAYLOR COUNTY.

(1.) The maple worms do some hurt. (2.) Borers injure locusts (black).

UNION COUNTY.

(1.) Green worms injure maples (soft). (2.) Borers in locusts, and worms in maples, are very damaging. (3.) Borers kill locusts (black).

WAPELLO COUNTY.

(1.) Borers are fatal to locusts (black) and have almost destroyed them.

WARREN COUNTY.

(1.) Borers kill locusts (black) and and cottonwoods. (2.) Striped worms eat the leaves from maples.

WASHINGTON COUNTY.

(1.) Borers injure trees badly. (2.) Borers kill locusts (black).

WAYNE COUNTY.

(1.) Two kinds of borers make trouble; one attacks the trunks of trees, the other the twigs. Beetles and maple worms do harm.

WINNEBAGO COUNTY.

(1.) The cut-worm does great damage to young maples by cutting them down soon after they come through the ground.

WINNESHIEK COUNTY.

(1.) Mice, rabbits, and hard winds are injurious to trees. (2.) Worms eat the leaves from willows, but no great injury is perceptible therefrom.

WRIGHT COUNTY.

(1.) Light green worms strip the leaves from willows. A species of worm works under the bark near the ground, and does great injury to cottonwoods and willows.

IV.—OTHER DIFFICULTIES OBSERVED IN ATTEMPTS AT TREE-PLANTING.

ADAMS COUNTY.

(1.) Apathy on the part of the people. (2.) Trying to grow trees on wet, undrained lands, planting trees too thick, and neglect of cultivation.

AUDUBON COUNTY.

(1.) Transplanting nut-bearing trees. They should be planted from seeds.

BOONE COUNTY.

(1.) Improper planting and cultivation. Planting trees too thick. (2.) Transplanting nut-bearing trees.

BREMER COUNTY.

(1.) Planting trees before the land is well broken. (2.) Improper planting and want of care and cultivation of young trees.

BUCHANAN COUNTY.

(1.) Seeds not germinating.

CASS COUNTY.

(1.) Negligence and want of interest on the part of farmers.

CERRO GORDO COUNTY.

(1.) Want of time, at the proper season, to plant trees.

CHEROKEE COUNTY.

(1.) Want of time to plant and neglect of attention and proper cultivation of young trees. (2.) Planting seeds too deep, setting cuttings too late, setting trees in unbroken sod, and heavy wind-storms occurring after trees are set. They get loose in the ground and die.

CHICKASAW COUNTY.

(1.) Indifference and indolence. (2.) Dry weather in spring before the cuttings take root. (3.) Shiftlessness. (4.) Neglect of young trees for the first three years.

CLARKE COUNTY.

(1.) Water standing about the roots of young trees.

CLAY COUNTY.

(1.) Dry weather in spring. (2.) Trees shipped from the East never do well. (3.) Planting too late in spring.

CLAYTON COUNTY.

(1.) Negligence and planting too wide apart. (2.) Careless planting. (3.) Negligence for first three years after planting, and want of mulching.

DALLAS COUNTY.

(1.) Want of interest in planting, negligence in cultivation, and long-continued droughts in summer.

DAVIS COUNTY.

(1.) Want of attention and proper cultivation.

DECATUR COUNTY.

(1.) Laziness and want of proper attention. (2.) Negligence and a general disposition to shun labor.

DELAWARE COUNTY.

(1.) Laziness. (2.) Want of energy, want of care and attention when trees are first set out. (3.) Want of perseverance.

DICKINSON COUNTY.

(1.) High winds and drought. (2.) Drought in June. (3.) Dry weather in spring, and south winds, which cause the bark to split. (4.) Planting on land before it is subdued.

FAYETTE COUNTY.

(1.) Shiftlessness and want of proper care to young trees. (2.) Want of labor necessary to cultivate. (3.) Drought in spring, before plants can take root.

FLOYD COUNTY.

(1.) Planting too thick. (2.) Want of cultivation and failure to keep down the weeds.

FREMONT COUNTY.

(1.) The frequent overflows of the Missouri River are the greatest difficulty. (2.) Want of time.

GREENE COUNTY.

(1.) Carelessness on the part of farmers.

GRUNDY COUNTY.

(1.) Transplanting nut-bearing trees. (2.) Planting seeds too deep; cutting the roots too short in taking up for transplanting; letting the roots get too dry before setting out; want of preparation of land, and want of cultivation of young trees. (2.) Failure of cultivation for first three years.

GUTHRIE COUNTY.

(1.) Want of time at the period when trees should be planted; planting too thick; negligence and failure of thinning out.

HAMILTON COUNTY.

(1.) Using cuttings that are too small, which causes them to die before putting out leaves.

HANCOCK COUNTY.

(1.) Want of attention and failure of proper cultivation.

HARRISON COUNTY.

(1.) Indifference. (2.) Transplanting nut trees. (3.) Negligence. (4.) Drought in spring. (5.) Drought in summer. (6.) Laziness.

HENRY COUNTY.

(1.) The greatest difficulty is to procure seeds and plants.

HOWARD COUNTY.

(1.) Want of proper cultivation.

IDA COUNTY.

(1.) Bad-conditioned trees are received from the nurseries; many die before reaching their destination.

IOWA COUNTY.

(1.) Planting on land before it is subdued and the sod broken.

JASPER COUNTY.

(1.) Ignorance presents the greatest difficulty.

JOHNSON COUNTY.

(1.) Negligence. (2.) Planting before the land is in proper condition, and want of cultivation.

KEOKUK COUNTY.

(1.) Planting trees in soil not adapted to them.

KOSSUTH COUNTY.

(1.) Want of cultivation, and drought in spring.

LOUISA COUNTY.

(1.) Want of attention and the proper cultivation.

LUCAS COUNTY.

(1.) Extremes of wet and dry weather are both injurious.

LYON COUNTY.

(1.) Hard freezes in winter present serious difficulty, as large numbers of trees die from severity of the climate.

MARSHALL COUNTY.

(1.) Indifference and neglect. (2.) Planting trees too thick, and transplanting nut-bearing trees. (3.) Want of care in planting, and planting before the land is subdued and pulverized.

MILLS COUNTY.

(1.) Hot, dry south winds are very serious difficulties.

MONONA COUNTY.

(1.) Careless planting and want of cultivation. (2.) Inattention.

MONROE COUNTY.

(1.) Inattention to young trees. (2.) Excessive wet weather and too much drought. Neglect after planting and ravages of stock.

MONTGOMERY COUNTY.

(1.) Want of care and ignorance as to the proper kinds of plants to set out; also, lack of proper cultivation.

O'BRIEN COUNTY.

(1.) Prairie fires. (2.) General carelessness. (3.) Dry weather. (4.) Planting too late in spring and long, dry spells in summer. (5.) Hard winds.

PLYMOUTH COUNTY.

(1.) Want of proper cultivation for the three years succeeding the planting.

POCAHONTAS COUNTY.

(1.) Want of cultivation. (2.) Ravages of stock, prairie fires, and want of fence protection. (3.) Dry weather after trees are planted and carelessness and want of knowledge as to management. (4.) Planting too late in the spring.

POTTAWATTAMIE COUNTY.

(1.) Planting too late in the spring. (2.) Carelessness in planting and cultivation.

POWESHIEK COUNTY.

(1.) Dry weather after trees are set out is a serious difficulty.

RINGGOLD COUNTY.

(1.) Carelessness in planting and neglect to protect young trees from stock.

SAC COUNTY.

(1.) Stock running at large.

SCOTT COUNTY.

(1.) Drought and lack of cultivation. Stock running at large. (2.) Long, hard winters. (3.) Negligence in planting and in cultivation.

SIOUX COUNTY.

(1.) Want of means necessary to make tree planting a success.

TAMA COUNTY.

(1.) Want of knowledge as to the preparation of the soil, how and when to plant, and the proper cultivation necessary to give young trees.

TAYLOR COUNTY.

(1.) Transplanting in the fall, want of proper preparation of the soil, insufficient pruning, and want of culture (2.) Transplanting trees that have a tap root.

UNION COUNTY.

(1.) Want of attention and the proper cultivation.

WAPELLO COUNTY.

(1.) The ravages of stock running at large on farms are very damaging to trees.

WAYNE COUNTY.

(1.) Laziness on the part of farmers, and stock running at large.

WINNEBAGO COUNTY.

(1.) Dry weather in summer the first two years after trees are set out.

WINNESHIEK COUNTY. ☐

(1.) Stock running at large. (2.) Fall planting. (3.) Planting before the land is subdued, want of cultivation, and continuance of drought.

WRIGHT COUNTY. ☐

(1.) Planting before the land is subdued and pulverized. (2.) Late planting in spring and dry weather after planting.

KANSAS.

I.—THE KIND OF TREES, IN ORDER OF PREFERENCE, FOUND TO HAVE BEEN GROWN SUCCESSFULLY.

ALLEN COUNTY. ☐

(5.) Walnut (black), ash (white), catalpa (hardy), locust (honey), elm (white), sycamore, ash (green), Osage orange, cottonwood, box-elder, elm (red), oak (white), oak (burr), hackberry, cherry, cedar (red), maple (soft), pine (Austrian), Kentucky coffee, pecan, redbud, mulberry.

ANDERSON COUNTY. ☐

(3.) Walnut (black), catalpa (hardy), locust (honey), Osage orange, cottonwood, maple (soft), cedar (red), ash (white), elm (white), box-elder, poplar (Lombardy), willow (white), ash (green), hackberry, elm (red), Kentucky coffee, pine (Austrian), maple (hard).

ATCHISON COUNTY. ☐

(9.) Walnut (black), cottonwood, maple (soft), box-elder, oak (burr), hickory, maple (hard), catalpa, elm (white), mulberry, oak (white), poplar (Lombardy), locust (honey), ash (white), sycamore, elm (red), cedar (red), willow (white), basswood (or linden), pine (Austrian), Kentucky coffee, spruce (Norway), oak (red), locust (black), hemlock, larch (European), Osage orange.

BARBOUR COUNTY. ☐

(2.) Walnut (black), mulberry, Kentucky coffee, ash (white), oak (post), catalpa, elm (white), locust (honey), oak (white), hackberry, cottonwood, hickory, cedar (red), sycamore.

BARTON COUNTY. ☐

(5.) Cottonwood, box-elder, ash (white), walnut (black), locust (honey), catalpa, elm (white), ailanthus, maple (soft), willow (white), sycamore, Osage orange, Kentucky coffee, mulberry, locust (yellow).

CHEROKEE COUNTY. ☐

(5.) Maple (soft), walnut (black), elm (white), catalpa, locust (honey), ash (white), oak (burr), mulberry, cottonwood, box-elder, poplar (Lombardy), maple (hard), hickory, pecan, sycamore, Osage orange, ash (green), hackberry, basswood (or linden), locust (yellow), birch, elm (red), Kentucky coffee, chestnut, oak (post), oak (red), sassafras, redbud, persimmon, willow (white), cherry, oak (white).

CLOUD COUNTY. ☐

(5.) Cottonwood, box-elder, maple (soft), ash (white), walnut (black), elm (white), catalpa, elm (red), locust (honey), maple (hard).

CRAWFORD COUNTY.

(3.) Catalpa, walnut (black), ash (white), ash (green), cottonwood, box-elder, elm (white), elm (red), oak (burr), hickory, mulberry, ailanthus, poplar (Lombardy), Osage orange, hackberry, locust (honey), oak (white), basswood (or linden), pine (Austrian), cedar (red), Kentucky coffee, pecan.

DAVIS COUNTY.

(1.) Maple (soft), box-elder, catalpa, walnut (black), ash (white), hackberry, willow (white), cottonwood, mulberry, hickory, locust (honey).

DECATUR COUNTY.

(5.) Walnut (black), ash (white), box-elder, cottonwood, elm (white), locust (honey), Osage orange, maple (soft), willow (white), butternut (or white walnut), maple (hard), catalpa, oak (white), hickory.

DICKINSON COUNTY.

(10.) Walnut (black), box-elder, cottonwood, ash (white), elm (white), maple (soft), locust (honey), catalpa, hackberry, ash (green), mulberry, poplar (Lombardy), ailanthus, hickory, locust (black), elm (red), pecan, sycamore, pine (Austrian), cedar (red), spruce (Norway), pine (white), pine (Scotch).

DOUGLAS COUNTY.

(3.) Osage orange, cottonwood, mulberry, walnut (black), locust (honey), box-elder, maple (soft), elm (white), ash (green), ash (white), hackberry, elm (red), cedar (red), poplar (Lombardy), hickory, pine (Austrian), pine (Scotch), pine (white), willow (white), maple (hard), basswood (or linden), ailanthus, horse-chestnut, Kentucky coffee, catalpa, spruce (Norway), arbor-vitæ, tamarack.

EDWARDS COUNTY.

(3.) Cottonwood, walnut (black), box-elder, mulberry, Osage orange, Kentucky coffee, ash (white), elm (white), maple (soft), ailanthus.

ELK COUNTY.

(14.) Walnut (black), maple (soft), cottonwood, catalpa, box-elder, ash (white), hackberry, elm (white), Osage orange, elm (red), Kentucky coffee, hickory, locust (honey), cherry, mulberry, oak (burr), sycamore, poplar (Lombardy), pecan, willow (white), cedar (red), spruce (Norway), pine (white), pine (Austrian), locust (black), ailanthus, oak (white), oak (red), oak (post), redbud, arbor-vitæ, butternut (or white walnut), chestnut, maple (hard), horse-chestnut.

ELLIS COUNTY.

(3.) Osage orange, walnut (black), locust (honey), ash (white), catalpa, hackberry, elm (red), ailanthus, maple (soft), cottonwood, elm (white), box-elder, cedar (red), ash (green), cherry, oak (white), Kentucky coffee, poplar (Lombardy), mulberry, locust (black).

FORD COUNTY.

(2.) Walnut (black), catalpa, locust (honey), box-elder, elm (white), ailanthus, cottonwood, Osage orange, ash (white), hackberry.

GOVE COUNTY.

(3.) Walnut (black), cottonwood, box-elder, ailanthus, ash (white), catalpa, locust (honey).

GRAHAM COUNTY.

(7.) Walnut (black), ash (white), cottonwood, box-elder, elm (white), cherry, elm (red), hackberry, catalpa, ailanthus, Kentucky coffee, poplar (Lombardy), Osage orange, maple (soft), cedar (red), willow (white), balm of Gilead.

GRAY COUNTY.

(2.) Locust (honey), cottonwood, Osage orange, mulberry, box-elder, walnut (black), hackberry, ash (green).

HAMILTON COUNTY.

(1.) Cottonwood, box-elder, walnut (black).

HARVEY COUNTY.

(7.) Cottonwood, walnut (black), ash (white), box-elder, maple (soft), elm (white), catalpa, ash (green), locust (honey), mulberry, Osage orange, hackberry, poplar (Lombardy), balm of Gilead, locust (black), cedar (red), elm (red), Kentucky coffee, sycamore, maple (hard), willow (white), oak (white), cherry, oak (burr), oak (red), oak (black), ailanthus, butternut or (white walnut), pecan, persimmon, hickory, chestnut, pine (Austrian), spruce (Norway), pine (white), pine (Scotch).

JEFFERSON COUNTY.

(4.) Walnut (black), maple (soft), cottonwood, catalpa, willow (white), poplar (Lombardy), locust (honey), Osage orange, sassafras, dogwood, maple (hard), mulberry.

JEWELL COUNTY.

(3.) Walnut (black), box-elder, cottonwood, ash (white), maple (soft), oak (burr), locust (honey), elm (white), hackberry, catalpa.

JOHNSON COUNTY.

(12.) Walnut (black), ash (white), maple (soft), box-elder, cottonwood, Osage orange, locust (honey), catalpa, elm (white), elm (red), maple (hard), poplar (Lombardy), Kentucky coffee, locust (black), cedar (red), spruce (Norway), pine (Austrian), mulberry, pine (white), pine (Scotch), cherry, basswood (or linden), hackberry, ash (green), pecan, willow (white), ailanthus, chestnut, oak (white), oak (burr), sycamore, hickory.

KINGMAN COUNTY.

(5.) Cottonwood, box elder, catalpa, poplar (Lombardy), maple (soft), walnut (black), ash (white), elm (white), Osage orange, willow (white), butternut (or white walnut), elm (red), mulberry, hickory, cherry, ash (green), redbud, basswood (or linden), Kentucky coffee, sycamore, oak (red).

LABETTE COUNTY.

(17). Walnut (black), maple (soft), ash (white), catalpa, cottonwood, box-elder, elm (white), willow (white), Osage orange, ash (green), Kentucky coffee, hickory, locust (honey), pecan, elm (red), hackberry, oak (burr), cedar (red), pine (white), pine (Scotch), spruce (Norway), pine (Austrian), mulberry, sycamore, poplar (Lombardy), cherry, chestnut, ailanthus, maple (hard), oak (white), persimmon, locust (black), balm of Gilead, ironwood, gum (sweet), arbor-vitæ, oak (post).

LANE COUNTY.

(1). Walnut (black), cottonwood, cherry, box-elder, ash (white).

LEAVENWORTH COUNTY.

(8). Walnut (black), cottonwood, maple (soft), elm (white), hickory, ash (white), mulberry, maple (hard), Osage orange, sycamore, oak (white), oak (burr), willow (white), poplar (Lombardy), box-elder, Kentucky coffee, hackberry, redbud, chestnut, basswood (or linden), catalpa, pecan, locust (honey), cypress, oak (red), ailanthus, elm (red), pine (Austrian), spruce (Norway), pine (white), pine (Scotch), horse-chestnut (or buckeye), arbor-vitæ, cedar (white), balsam fir.

LINCOLN COUNTY.

(3). Cottonwood, box-elder, ash (white), elm (white), walnut (black), catalpa, maple (soft), hackberry, oak (white), mulberry, willow (white), maple (hard), chestnut, ailanthus.

LINN COUNTY.

(10.) Cottonwood, maple (soft), box-elder, maple (hard), walnut (black), elm (white), catalpa, ash (white), hickory, cedar (red), locust (honey), oak (burr), poplar (Lombardy), Kentucky coffee, hackberry, oak (white), pine (white), spruce (Norway), elm (red), mulberry, cherry, pecan, basswood (or linden), pine (Austrian), pine (Scotch), persimmon, locust (black), ailanthus, oak (red), willow (white), redbud, sycamore, Osage orange.

LYON COUNTY.

(2.) Cottonwood, walnut (black), maple (soft), oak (white), box-elder, Osage orange, elm (white), ash (white), hickory, mulberry, elm (red), redbud, willow (white),

M'PHERSON COUNTY.

(12.) Cottonwood, box-elder, walnut (black), ash (white), maple (soft), catalpa, elm (white), willow (white), locust (honey), ash (green), elm (red), ailanthus, maple (hard), poplar (Lombardy), Osage orange, mulberry, oak (white), oak (burr), persimmon, cedar (red), hackberry, hickory, cherry, chestnut, locust (black).

MIAMI COUNTY.

(5.) Walnut (black), cottonwood, box-elder, catalpa, maple (soft), elm (red), hickory, oak (burr), elm (white), ash (white), maple (hard), oak (white), oak (red), locust (black), mulberry, Osage orange, locust (honey), Kentucky coffee, oak (post), ash (green), hackberry, pecan, sycamore, cherry, basswood (or linden), pine (Austrian), spruce (Norway), cedar (red), pine (Scotch), pine (white).

MONTGOMERY COUNTY.

(4.) Walnut (black), maple (soft), cottonwood, catalpa, elm (white), elm (red), box-elder, Osage orange, cedar (red), ash (green), locust (black), poplar (Lombardy), ash (white), mulberry, pine (Scotch).

MORRIS COUNTY.

(2.) Cottonwood, box-elder, maple (soft), ash (white), hackberry, elm (white), elm (red), walnut (black), mulberry.

NEMAHA COUNTY.

(11.) Cottonwood, box-elder, walnut (black), elm (white), locust (honey), elm (red), ash (white), maple (soft), catalpa, oak (burr), mulberry, poplar (Lombardy), hickory, oak (white), willow (white), hackberry, Osage orange, cedar (red), spruce (Norway), chestnut, pine (Scotch), oak (red), sycamore, Kentucky coffee, maple (hard), basswood (or linden), horse-chestnut (or buckeye), balsam fir, ash (green), beech, locust (black), ailanthus, pine (Austrian), cherry, pecan, pine (white), butternut (or white walnut), magnolia, aspen, redbud.

NESS COUNTY.

(9.) Cottonwood, walnut (black), box-elder, locust (honey), ash (white), catalpa, hackberry, Osage orange, Kentucky coffee, willow (white), maple (soft), elm (white), ailanthus, locust (black), mulberry, ash (green), China, cedar (red), spruce (Norway), elm (red), pine (Scotch).

NORTON COUNTY.

(3.) Walnut (black), cottonwood, ash (white), locust (honey), box-elder.

OSBORN COUNTY.

(3.) Box-elder, cottonwood, mulberry, locust (honey), ash (white), walnut (black), hackberry, poplar (Lombardy), Kentucky coffee, elm (white), oak (white), Osage orange, willow (white), dogwood, locust (black), maple (soft).

OTTAWA COUNTY.

(8.) Cottonwood, walnut (black), maple (soft), box-elder, ash (white), elm (white), locust (honey), Kentucky coffee, elm (red), catalpa, oak (burr), hackberry, mulberry, Osage orange, ash (green), oak (white), locust (black), willow (white), ailanthus, poplar (Lombardy), butternut (or white walnut), pine (white), spruce (Norway).

PAWNEE COUNTY.

(6.) Cottonwood, box-elder, walnut (black), catalpa, Osage orange, locust (honey), ash (green), elm (white), ash (white), hackberry, Kentucky coffee, cedar (red), ailanthus, mulberry, maple (soft), elm (red), willow (white), locust (black), poplar (Lombardy), pine (Austrian).

PHILLIPS COUNTY.

(7.) Walnut (black), ash (white), box-elder, locust (honey), maple (soft), cottonwood, hackberry, catalpa, butternut (or white walnut), Kentucky coffee, elm (white), elm (red), Osage orange, willow (white), poplar (Lombardy), oak (burr), ash (green), mulberry, maple (hard), ailanthus, locust (black), pecan.

RENO COUNTY.

(22.) Cottonwood, walnut (black), box-elder, catalpa, ash (white), maple (soft), mulberry, Osage orange, poplar (Lombardy), locust (honey), willow (white), elm (white), ailanthus, hackberry, ash (green), oak (white), cedar (red), hickory, sycamore, pine (Scotch), pine (white), pine (Austrian), maple (hard), Kentucky coffee, chestnut, arbor-vitæ, locust (black).

RICE COUNTY.

(8.) Walnut (black), box-elder, catalpa, maple (soft), ash (white), elm (white), cottonwood, mulberry, locust (honey), locust (black), ailanthus, Kentucky coffee, poplar (Lombardy), Osage orange, ash (green), hackberry, elm (red), cedar (red), pine, (Austrian), pine (Scotch), pine (white), persimmon, maple (hard), sycamore.

ROOKS COUNTY.

(32.) Walnut (black), cottonwood, box-elder, ash (white), catalpa, maple (soft), locust (honey), elm (white), hackberry, oak (burr) oak (white), elm (red), willow (white), ailanthus, poplar (Lombardy), Osage orange, locust (black), Kentucky coffee, mulberry, cedar (red), maple (hard), ash (green), hickory, butternut (or white walunt), pecan, pine, (white), persimmon, spruce (Norway).

RUSH COUNTY.

(18.) Walnut (black), ash (white), cottonwood, box-elder, locust (honey), Osage orange, mulberry, elm (white), catalpa, locust (black), hackberry, poplar (Lombardy), oak (white), willow (white), sycamore, oak (burr), Kentucky coffee, hickory, cherry (black), butternut (or white walnut), pine (white), cedar (red), tamarack, balm of Gilead.

SALINE COUNTY.

(7.) Walnut (black), cottonwood, box-elder, maple (soft), ash (white), Osage orange, locust (honey), locust (black), elm (white), catalpa, mulberry, oak (burr), oak (white), Kentucky coffee, elm (red), oak (red), poplar (Lombardy), maple (hard), hickory, willow (white), hackberry.

SEQUOYAH COUNTY.

(4.) Cottonwood, walnut (black), box-elder, maple (soft), elm (white), poplar (Lombardy), ash (white), pine (Austrian), pine (white), pine (Scotch), sycamore, mulberry, hackberry, locust (honey).

SHERIDAN COUNTY.

(4.) Box-elder, cottonwood, ash (white), walnut (black), maple (soft), locust (honey), ailanthus, hackberry, catalpa, Osage orange, ash (green), willow (white).

SMITH COUNTY.

(9.) Walnut (black), ash (white), box-elder, locust (honey), cottonwood, maple (soft), Osage orange, elm (white), ash (green), poplar (Lombardy), hickory, horse-chestnut (or buckeye).

STAFFORD COUNTY.

(11.) Cottonwood, walnut (black), box-elder, ash (white), catalpa, poplar, maple (soft), locust (honey), mulberry, Osage orange, willow (white), hackberry, pecan, ailanthus, oak (white), Kentucky coffee, maple (hard).

SUMNER COUNTY.

(14.) Walnut (black), cottonwood, ash (white), box-elder, catalpa, maple (soft), elm (white), Osage orange, mulberry, hackberry, locust (honey), ash (green), Kentucky coffee, willow (white), poplar (Lombardy), oak (white), ailanthus, locust (black), elm (red), pecan, maple (hard), hickory, oak (burr), redbud, chestnut, basswood (or linden), persimmon.

TREGO COUNTY.

(9.) Cottonwood, box-elder, walnut (black), ash (white), ailanthus, willow (white), locust (honey), catalpa, Osage orange, poplar (Lombardy), maple (hard), oak (white), oak (burr), elm (white), locust (black).

WABAUNSEE COUNTY.

(5.) Walnut (black), cottonwood, box-elder, maple (soft), catalpa, cedar (red), maple (hard), pine (Scotch), mulberry, elm (red), oak (white), elm (white), ash (white), poplar (Lombardy), Kentucky coffee, locust (honey), hackberry, sycamore, Osage orange, cherry, oak (burr), basswood (or linden).

WASHINGTON COUNTY.

(10,) Walnut (black), maple (soft), ash (white), elm (white), locust (honey), cottonwood, box-elder, elm (red), catalpa, hackberry, oak (white), oak (burr), Osage orange, mulberry, hickory, cedar (red), Kentucky coffee, poplar (Lombardy), ailanthus, locust (black), butternut (or white walnut), cherry, basswood (or linden), larch (European), willow (white), maple (hard), beech.

WILSON COUNTY.

(2.) Walnut (black), Osage orange, maple (soft), box-elder, cottonwood, oak (white), oak (burr), ash (white), ash (green), hickory.

WOODSON COUNTY.

(5.) Walnut (black), cottonwood, maple (soft), box-elder, catalpa, locust (honey), elm (white), poplar (Lombardy), Osage orange, oak (white), oak (burr), ash (white), hackberry, mulberry, locust (black).

WYANDOTTE COUNTY.

(1.) Walnut (black), maple (soft), pecan, sycamore, cottonwood, Kentucky coffee, locust (black), maple (hard), elm (white), locust (honey), box-elder, elm (red), Osage orange, ash (white), ash (green), willow (white), basswood (or linden), ailanthus, pine (Austrian), arbor-vitæ, spruce (Norway), cedar (red), balsam fir, pine (white), pine (Scotch), cedar (white), hemlock.

SUMMARY.

Fifty-three kinds of trees are reported from the State at large. In order of preference, the leading varieties are as follows: (1) Walnut (black), (2) cottonwood, (3) box-elder, (4) ash (white), (5) maple (soft), (6) catalpa, (7) locust (honey), (8) elm (white), (9) Osage orange, (10) mulberry, (11) hackberry, (12) elm (red), (13) poplar (Lombardy), (14) willow (white), (15) oak (white), (16) hickory, (17) oak (burr), (18) ailanthus, (19) ash (green), (20) Kentucky coffee, (21) maple (hard), (22) cedar (red), (23) locust (black), (24) cherry.

II.—THE KINDS TRIED WHICH PROVED UNSUCCESSFUL.

ALLEN COUNTY.

(2.) The maples, cottonwood, spruce (Norway), larch (European), and firs do not succeed on the dry prairies; the hot sun and drought kill them. Poplar (Lombardy) is short lived; it seems to do well and is thrifty, but in a few years it begins to die at the top, and very soon life is extinct. Box-elder is affected by hot weather and a flat-head borer, and catalpa is winter killed.

ANDERSON COUNTY.

(2.) Locust (black), chestnut, and ash (white) are killed by borers and dry, hot weather; Poplar (Lombardy) dies in a few years, and willow (white) and cottonwood are only suited to lowlands. They cannot stand hot sun and dry weather on the prairies. Ailanthus cannot endure hard winter freezes.

ATCHISON COUNTY.

(4.) Locusts (black and honey) are destroyed by borers, and ailanthus and catalpa die in winter.

BARTON COUNTY.

(2.) Hickory, maple (soft), and oaks die from hot, dry weather in summer. Cottonwood, on hot, dry plains is attacked by borers and affected by summer sun.

CLOUD COUNTY.

(2.) Poplar (Lombardy) is short lived. Tulip, oaks, hickories, beech and sassafras fail from unknown causes.

DECATUR COUNTY.

(3.) Cottonwood will not succeed on high, dry plains. Box-elder is killed by borers and hot sun in summer, and hickories, oaks and maple (hard) do not survive droughts and hot sun.

DICKINSON COUNTY.

(6.) Cottonwood, box-elder, and maple (soft) fail on high, dry land; the borers and hot sun kill them. Evergreens of all kinds suffer from hot, dry weather. Hickory, oaks, hazel, beech, birch, chestnut, maple (hard), basswood (or linden) and willows, all fail, supposed to be on account of the dry atmosphere and soil, there being very little, if any moisture in either. Locusts (black and honey) are killed by borers, and catalpa cannot stand hard freezes in winter.

DOUGLAS COUNTY.

(1.) Chestnut is not adapted to the climate; poplar (Lombardy) and tulip are killed by borers and hard winters, while birch, beech and evergreens die from effects of drought and hot sun.

EDWARDS COUNTY.

(1.) Cottonwood does not succeed on high land; the drought, heat and borers kill them. They do well on low or swamp lands.

ELK COUNTY.

(6.) Poplar (Lombardy) and Kentucky coffee are short lived. They start off well, and seem to thrive, but die in a few years. Locusts (black and honey) and maple (soft) are subject to borers, and the cottonwood on high land is killed by borers. Chestnut is not suited to soil and climate.

ELLIS COUNTY.

(4.) Cottonwoods do not succeed on high land: the hot, dry weather and borers kill them. Poplar (Lombardy) is short-lived, and chestnut, beech and the evergreens die in summer, being unsuited to the climate. Mulberry does not succeed.

FORD COUNTY.

(1.) Box-elder is affected by drought and borers; large numbers die.

GOVE COUNTY.

(2.) Maples and willows do not succeed on high ground; the hot sun and drought kill them. Catalpa is winter-killed. Osage orange, hickory, chestnut, butternut (or white walnut), and pecan die from drought and hot, dry winds in summer, while locust (black) is killed by borers.

GRAY COUNTY.

(2.) Maples, and basswood (or linden) are killed by insects when the trees are very small.

HARVEY COUNTY.

(4.) Chestnut, beech, cottonwood, and the maples are killed by hot, dry weather, and grubs or borers. Poplar (Lombardy) is short-lived, and locust (black) is a complete failure on account of the borers.

JEFFERSON COUNTY.

(3.) Locust (black) is killed by borers. The evergreens, beech, butternut (or white walnut), and chestnut cannot stand the hot sun and dry weather in summer.

JEWELL COUNTY.

(1.) Chestnut is not suited to soil and climate. There is not sufficient moisture in the soil and atmosphere.

JOHNSON COUNTY.

(6.) Poplar (Lombardy), willow (white), and beech are short-lived, and do not succeed well. Maples and chestnut are not hardy, and locust (black) is killed by borers. Evergreens cannot stand the hot sun.

KINGMAN COUNTY.

(2.) Evergreens, balm of Gilead, and willow (white), die from hot summer sun. Poplar (Lombardy) is short-lived, and beech and birch are unsuited to the climate.

LABETTE COUNTY.

(9.) Locust (black) and box-elder are killed by borers and hot sun; maples are injured by insects, and larch (European) the sun scalds. The bark cracks and comes off. Willows are killed by winter and cannot stand hard freezing. Arbor vitæ suffers from the hot sun, while mulberry, basswood (or linden), butternut (or white walnut), and poplar (Lombardy) all die from some climatic cause. They are short-lived.

LANE COUNTY.

(1.) Maple (soft) and arbor vitæ die from hot, dry weather.

LEAVENWORTH COUNTY.

(6.) Locust (black) is killed by borers, and larch (European) and all evergreens die in summer. They cannot stand hot sun and dry weather. Poplar (Lombardy) is short-lived, and maples suffer from sun-blight.

LINCOLN COUNTY.

(1.) Locust (black) is killed by borers, and box-elders by a worm or borer that cuts in the wood at the ground.

LINN COUNTY.

(4.) Walnut (black) is killed by borers and worms, and locust (black) by borers, which are very destructive. Birch, beech and evergreens cannot stand the hot, dry weather.

M'PHERSON COUNTY.

(7.) Hackberry dies out after the first year; hickory does not grow; locust (black) suffers from borers and blight; ash (white) is attacked by worms and grubs or borers; cottonwoods fail on high dry land; oaks, chestnut, butternut (or white walnut), and the evergreens cannot stand hot, dry, summer weather; and basswood (or linden), pecan, and sassafras are a failure, from supposed climatic causes.

MIAMI COUNTY.

(4). Locusts (black) are killed by borers; it is almost a waste of time to plant them; chestnut and butternut (or white walnut) cannot stand through the summer, and tulip and maple (soft) fail on dry prairie.

MORRIS COUNTY.

(1.) Poplar (Lombardy) is short-lived; ash (prickly) is not indigenous, ailanthus is winter-killed, and borers exterminate locusts (black).

NEMAHA COUNTY.

(7.) Locust (black) is killed almost entirely by borers; chestnut dies in winter; maple (hard), no cause given beyond "it fails"; maple (soft) and box-elder are affected by worms and insects; beech, pines, firs, butternut (or white walnut), and hickory cannot stand the heat and drought; willow (white) is winter-killed, and poplar (Lombardy) short-lived.

NESS COUNTY.

(4.) Elms (white and red), hickory, oak, maples (soft and hard), chestnut, butternut (or white walnut), balsams, and ash (white) cannot stand hot, dry, summer weather. Poplar (Lombardy) is short-lived.

OSBORN COUNTY.

(1.) Catalpa, maple (soft), and ailanthus die in winter; they cannot stand the hard freezes; chestnut dies in hot dry weather. The climate does not seem to suit them.

OTTAWA COUNTY.

(6.) Hickory, chestnut, beech, pines, and all the evergreens die in summer; they cannot stand the hot sun and drought. Catalpa freezes in winter; box-elder suffers from hot sun and borers, and sassafras fails from causes unknown.

PHILLIPS COUNTY.

(5.) The maples, butternut (or white walnut), Kentucky coffee, chestnut, and evergreens fail on account of the long drought; there is no moisture in the ground or atmosphere. Catalpas cannot stand the winter freezes.

RENO COUNTY.

(9.) Larch (European and American), hickories, willows (except in bottom lands), arbor vitæ, and the oaks all burn in summer; they cannot stand sun and drought. Kentucky coffee, hackberry, pecan, maple (hard), chestnut, elms, and ash (white) are all more or less injured by worms, hot sun and drought, and die out badly. Ailanthus is winter-killed, and does not seem to be hardy.

RICE COUNTY.

(1.) Poplar (Lombardy) is short-lived. Cottonwoods are a failure on high land; the maples, hickory, oaks, butternut (or white walnut), horse-chestnut, chestnut, larch (European), and evergreens are affected by hot sun and drought, and die out while young.

ROOKS COUNTY.

(10.) Cottonwoods do not succeed on high, dry land; the sun kills them and they are also subject to borers. Catalpa, ailanthus, and willow (white) die in winter. Hickory, oaks, maple (soft), birch, Kentucky coffee and persimmon die in summer; they cannot stand the hot sun and drought. Poplar (Lombardy), is short-lived, and dies in a few years.

RUSH COUNTY.

(9.) Maple (soft), catalpa, and willow (white) cannot stand hard winters. Poplar (Lombardy) is subject to winter-kill and short-lived; elm (white), hackberry, hickory, oaks, basswood (or linden), die in summer; locust (black), ash (white), box-elder suffer from worms and borers, and cottonwoods fail on high land; they require moisture.

SALINE COUNTY.

(2.) Maple (hard), birch, beech, ash (white), basswood (or linden) fail in hot, dry summers.

SHERIDAN COUNTY.

(1.) Walnut (black) and hickory cannot stand the hot sun and drought; cottonwood, box-elder, the maples, ash (white), and poplar (Lombardy) fail in certain localities and in certain seasons. They are mainly affected by freezing.

SMITH COUNTY.

(7.) Cottonwoods, maples, and willows will not do well on high land. They require moisture and consequently thrive best on low or bottom lands. Locust (black) is almost extinguished by borers; box-elder cannot stand cold winters, and poplar (Lombardy) grows off nicely, but for some cause dies in a few years.

STAFFORD COUNTY.

(6.) Catalpa and ailanthus are affected somewhat by dry weather, but suffer most from hard freezes; elm (white), cottonwoods, and willow (white) do not succeed on high dry land, and the maples, oaks, and ashes are killed by excess of heat and cold, mostly by cold.

SUMNER COUNTY.

(8.) Ash (mountain) is not suited to the climate; evergreens all die in summer, as they cannot stand the heat and drought; box-elder is killed by borers; maple (soft) the sun kills; cottonwoods fail on high land; poplar (Lombardy) is short-lived, and oaks and hickories do not seem to be suited to soil and climate. Some say the soil contains too much alkali. Catalpa dies down in winter, but often sprouts again in spring.

TREGO COUNTY.

(6.) Oaks, ash (white), walnut (black), hickory, chestnut, cedar (red), pines, and all evergreens, elms, and maples die in summer during the long dry spells. Locust (black) is killed by borers; ailanthus and catalpa die in winter; poplar (Lombardy) the winter kills, and is short-lived.

WABAUNSEE COUNTY.

(3.) Chestnut, beech, pines, hemlock, willow (white), ash (white), and hickory cannot stand the summer climate. Cottonwood is not successful on high dry land, and is of not much value for timber or firewood.

WASHINGTON COUNTY.

(5.) The maples and larches (European) are sun-scalded; the winter kills ailanthus; poplar (Lombardy) is short-lived, and locust (black) is killed by borers.

WOODSON COUNTY.

(1.) Hickory and sycamore will not grow, from some unknown cause.

SUMMARY.

Forty kinds of trees are mentioned as having been tried which did not prove successful. The following is the list and the number of times each is stated in the reports:

Maple (soft), 25; chestnut, 21; poplar (Lombardy), 21; locust (black), 20; hickory, 18; maple (hard), 18; cottonwood, 17; evergreens, 14; beech, 13; oaks, 13; box-elder, 12; catalpa, 12; willow (white), 12; ash (white), 10; ailanthus, 9; butternut (or white walnut), 9; birch, 6; larch, 6; basswood (or linden), 6; elm (white), 5; Kentucky coffee, 4; pines, 4; arbor vitæ, 3; hackberry, 3; pecan, 3; sassafras, 3; tulip, 3; walnut (black), 3; balsam fir, 2; mulberry, 2; and ash (mountain), ash (prickly), balm of Gilead, cedar (red), horse-chestnut, hazel, hemlock, locust (honey), Osage orange, persimmon, spruce (Norway), and sycamore, each once.

III.—THE INJURIES NOTICED TO HAVE OCCURRED FROM INSECTS OR OTHER CAUSES.

ALLEN COUNTY.

(1.) The flat-head borer follows when the growth is checked by drought and hot weather. (2.) Maples (soft) are damaged by caterpillars eating the foliage. Box-elders are injured in the trunk by borers.

ANDERSON COUNTY.

(1.) Grasshoppers kill pines (Scotch).

ATCHISON COUNTY.

(1.) A species of worm on maple (soft) eats the leaves and injures the tree. (2.) Borers kill locusts (black). (3.) Worms eat leaves of maples in summer.

BARTON COUNTY.

(1.) The borers attack cottonwoods and cut into the trunk three or four inches above the ground. (2.) Limb-borers injure box-elders very much; green worms eat the leaves of ash (white) and cottonwood. (3.) A large green worm, resembling the tobacco worm, eats the leaves and buds of the ash (white) and checks its growth; box-elder is sometimes injured by borers; a small striped worm eats the leaves of cottonwoods, which retards their growth.

CHEROKEE COUNTY.

(1.) Borers injure maples to some extent. (2.) The maples (white) are sometimes injured by borers; they are liable to split and break very badly in wind storms. (3.) Locust (black) are killed by borers.

CLOUD COUNTY.

(1.) The tree-borers, or grubs, are very damaging, especially to locusts (black). Sun-scald seems to be the most injurious; the bark cracks or splits open on the south side of the trunk. (2.) Box-elders are injured badly by borers, and also ash (white) to some extent. (3.) The borers injure forest trees generally. (4.) Box-elders are injured very badly by borers.

CRAWFORD COUNTY.

(1.) Elms (white) and box-elders are sometimes attacked by borers and materially injured.

DECATUR COUNTY.

(1.) Jack rabbits do great damage to trees by cutting the bark just above the ground. The ash (white) is injured by a small bug eating the leaves and twigs in early summer. Gophers are very injurious to Osage orange; they cut the roots of young trees.

DICKINSON COUNTY.

(1.) The borers do great injury by cutting into the heart of trees. (2.) Borers injure box-elder and cottonwood, and rabbits damage the catalpa. (3.) Borers, very much resembling the apple-tree borer, do great injury to cottonwood and box-elder. (4.) Cottonwood and box-elder are injured by borers. Maple (soft) suffers from sun-scald. (5.) Locust and cottonwood are injured by borers. The handmaid moth and caterpillar do much damage by eating the leaves. (6.) Borers injure box-elders, and sun-scald is very destructive to some kinds of trees. (7.) Grubs or borers are very damaging. (8.) Borers and excessive dry weather are very injurious to young trees.

DOUGLAS COUNTY.

(1.) Borers (*Saperda calcarata*) attack cottonwoods and poplars (Lombardy). The flat-head borers injure box-elders, elms, maples (soft and hard) during the growing season and are very disastrous.

EDWARDS COUNTY.

(1.) Cottonwoods are attacked by large worms resembling the tobacco worm. They kill the trees very thoroughly some seasons.

ELK COUNTY.

(1.) The borers cut under the bark of trees and girdle them, causing much injury. (2.) Maples (soft) are injured by borers. (3.) Box-elders and maples are troubled with borers in trees transplanted during dry seasons. (4.) Maples and catalpas are injured by worms to some extent. (5.) Borers injure young maples, and a very bad-smelling worm eats the leaves of cottonwoods. (6.) Borers, caterpillars, and the hot sun are very injurious to young trees. (9.) Borers injure maples (soft) and cottonwoods very severely. A species of worm strips the leaves from walnuts (black), cottonwoods, elms and other kinds, leaving them in a nude condition, which retards their growth.

ELLIS COUNTY.

(1.) Gophers sometimes injure the young Osage orange; borers damage elms, box-elders, and cottonwoods. (2.) Grasshoppers do great damage to trees by eating the leaves and young twigs. (3.) The flat-head borer is very injurious to box-elders. The Troy borer appears in the ash, but no great injury has yet been developed.

GRAHAM COUNTY.

(1.) Grasshoppers injure walnuts (black) and willows (white) to some extent, and jack rabbits attack all kinds of trees in winter except walnut (black). (2.) Locust seedlings are destroyed by a species of cantharides. (3.) Jack rabbits are generally very injurious. (4.) The borers do some injury.

GRAY COUNTY.

(1.) Some injury is done to trees by a small lead-colored bug. Some seasons grasshoppers do much damage, but the greatest injury is worked by cattle running at large. (2.) Insects are troublesome and do some injury.

HARVEY COUNTY.

(1.) Borers injure box-elders to some extent, and the white caterpillar hurts cottonwoods. (2.) The cottonwood is injured more or less by borers, and walnuts and maples suffer from caterpillars to some extent. (3.) Rabbits and the borers are the worst enemies to young trees. (4.) Borers, or grubs, and caterpillars injure cottonwood, box-elder and poplar (Lombardy).

JEFFERSON COUNTY.

(1) Borers, caterpillars, worms and rabbits are all injurious to trees. (2) Maples are injured by a green worm that eats the foliage. (3.) Caterpillars, borers and droughts injure young trees materially.

JEWELL COUNTY.

(1.) Trees are sometimes injured by grasshoppers. (2.) Borers kill box-elder and the maples. (3.) A white borer does some injury.

JOHNSON COUNTY.

(1) Borers are most damaging to trees, and sun-scald injures some. (2) The locusts suffer most from grubs or borers. (3) The maples are subject to attacks by the maple-worm; they eat the foliage, leaving the tree nude. The locusts are very much injured by borers. (4.) Borers kill out the locusts, particularly the black. (5.) Borers injure locusts (black), box-elders, and maples (soft). (6.) Several species of caterpillar injure maple (soft), Osage orange and walnut (black). (7.) Maples are injured by worms.

KINGMAN COUNTY.

(1.) The tobacco, or cut-worm injures cottonwoods and poplar (Lombardy) by eating the leaves. Web-worms are sometimes bad on cherry trees, and rabbits are very destructive to young elms by eating off the bark. (2.) Borers and grasshoppers do considerable damage. (3.) Grasshoppers, web-worms and tobacco worms injure trees during the summer, and rabbits do likewise in winter. Moles, gophers and sand-rats eat the roots of young trees, causing them to die.

LABETTE COUNTY.

(1.) Worms frequently eat the foliage, and retard the growth of trees. (2.) Worms, borers and sun-scald are injurious to trees. (3.) Borers are very damaging to maples. (4.) Insects attack elms. (5.) Caterpillars injure maples, walnuts and cottonwoods. (6.) Maples and cottonwoods are injured by borers. (7.) Borers in hickories and the maples do much damage. (8.) Insects sting the trees, and the borers cut the wood, doing great injury. (9.) Borers and mice are destructive; the latter cut around the trees at the ground.

LANE COUNTY.

(1.) Cattle running at large destroy many trees.

LEAVENWORTH COUNTY.

(1.) Maple (soft) is sometimes injured by worms. (2.) Locust (black) is killed by borers. (3.) Worms sometimes cut into the heart of maples (soft), causing them to die.

LINCOLN COUNTY.

(1.) Box-elder is injured by borers. (2.) Grubs or borers are generally damaging.

LINN COUNTY.

(1.) Borers and caterpillars injure trees. (2.) Maples (soft) are injured in August and September by worms eating the leaves. (3.) Curculio is injurious to maples (soft). (4.) Sun-scald and the borers go hand in hand to render the plains treeless. (5.) Borers are very destructive to locusts (black).

LYON COUNTY.

(1.) Worms get under the bark of the ash (white), elms (white), and box-elder, and are very destructive. Cottonwoods and maples (soft) suffer badly from worms eating the leaves.

M'PHERSON COUNTY.

(1.) Worms or grubs injure the ash (white). (2.) Borers injure ash (white). (3.) Worms eat off the leaves of trees and the hot sun affects them materially. (4.) Worms and caterpillars are very injurious to ash (white), poplars (Lombardy), maples (soft), cottonwoods and box-elders. (5.) The borers are numerous and very destructive. (6.) A small, hairy worm injures walnuts.

MIAMI COUNTY.

(1.) Locusts (black) are destroyed by borers, and butternuts (or white walnuts), chestnuts and tulips injured by the hot sun. (2.) Borers and worms do great damage to young trees causing many to die.

MONTGOMERY COUNTY.

(1.) Sun-scald and borers are very destructive to forests. (2.) Borers injure maples (soft) and cottonwoods on high land.

MORRIS COUNTY.

(1.) Grasshoppers, insects of various kinds and violent winds do considerable damage to trees.

NEMAHA COUNTY.

(1.) Worms injure maples (soft) by eating the leaves. (2.) Locusts (black) are so much infested by borers that but few are left, and it is almost a waste of time and money to attempt to raise them; the maple worms do some injury. (3.) The borers, sun-scald and leaf-worms are all damaging to trees, especially the two former. (4.) Mice, rabbits, and many kinds of insects, strong winds and sudden changes of weather, are all injurious to trees.

NESS COUNTY.

(1.) Rabbits are destructive to young trees, cutting the bark. (2.) Rabbits and ground squirrels do considerable damage. (3.) Grasshoppers in some seasons injure trees by eating the leaves and twigs. (4.) A small bug similar to the blister-bug is injuring trees. (5.) Rabbits, mice and gophers are very destructive; a white grub sometimes eats the roots of trees just set out, causing them to die.

NORTON COUNTY.

(1.) The borers kill the box-elders. (2.) Drought is most injurious to young trees.

OSBORN COUNTY.

(1.) Borers sometimes get in maples (soft), and kill them.

OTTAWA COUNTY.

(1.) Borers are destructive in some localities. (2.) Worms injure maples (soft), and rabbits are troublesome, especially to young oak trees. (3.) Borers and excessive drought cause large numbers of trees to die. (4.) Cottonwoods suffer from worms. (5.) A species of caterpillar injures the walnuts (black). (6.) Drought is most injurious to trees. (7.) The borers, a green worm and caterpillars do damage. (8.) Borers injure cottonwoods, and drought injures all kinds of trees when young. (9.) Rabbits, borers and cattle are all very injurious. (10.) Flat-head borers are destructive to cottonwoods on dry land. (11.) Grasshoppers and borers damage young trees, killing many.

PAWNEE COUNTY.

(1.) Borers are very injurious to box-elders. (2.) Borers and worms injure cottonwoods and ash (white). (3.) Gophers attack Osage orange, and locusts (honey). (4.) Borers destroy the ash (white).

PHILLIPS COUNTY.

(1.) Hot summers and dry winters are very destructive to trees. (2.) Locusts are injured by a small insect. (3.) Dry weather in summer and autumn affects trees. (4.) Prairie fires are very destructive, and grasshoppers and gophers are very bad on the Osage orange and other kinds.

RENO COUNTY.

(1.) Polypeds and grasshoppers injure ash (white), cottonwoods, box-elders and maple (soft). (2.) A large green worm eats the leaves of box-elders and cottonwoods, which injures them badly. (3.) Grasshoppers are sometimes very destructive. (4.) Borers kill locusts (black), and cottonwoods. (5.) Rabbits are very damaging to young trees—also a large green worm. (6.) Drought, borers, worms and grasshoppers are all enemies to young trees. (7.) Borers and drought do the principal injury. (8.) Borers, worms, ants, moles and grasshoppers are injurious to trees. (9.) Borers injure cottonwoods.

RICE COUNTY.

(1.) Borers and worms are the most injurious in this section. (2.) Drought injures trees badly, causing the bark to crack; then the borers follow and complete the job of killing. (3.) Caterpillars cause some injury. (4.) Hailstorms are very injurious. (5.) Worms on the cottonwoods are damaging.

ROOKS COUNTY.

(1.) Rabbits cause the most injury, and grasshoppers are very bad some seasons. (2.) Rabbits and drought are very destructive. (3.) Borers kill the box-elders badly. (4.) Borers injure all trees to a greater or lesser extent. (5.) Borers and drought combined kill large numbers of trees. (6.) Borers are the greatest trouble. (7.) Worms injure cottonwoods, elms (white), and maples (soft). (8.) Insects injurious to trees are numerous, and are caused principally by drought. (9.) Grasshoppers injure box-elders, and red ants destroy catalpas the first season. (10.) Rabbits do the most harm, and an insect injures maples (soft). (11.) Borers and caterpillars injure box-elders and walnuts (black). (12.) Borers are very bad on high land. (13.) Borers on maples (soft), box-elders and ash (white) are very destructive; also a small grub-worm injures these trees.

RUSH COUNTY.

(1.) Rabbits and prairie squirrels are very destructive. (2.) Worms eat leaves off of various kinds of trees; the limbs and trees are exposed to the hot sun, and large

numbers die. (3.) Borers are very destructive to box-elders and maples (soft). (4.) Borers and drought cause great destruction. (5.) Rabbits and borers are very injurious to young trees. (6.) Borers are the worst things to contend against in planting trees. (7.) Rabbits do the most harm by cutting the bark from young trees. (8.) A small worm or grub gets into the roots of trees and kills them. (9.) Grasshoppers are very injurious, causing great destruction. (10.) Drought and insects are damaging; the latter seem to follow the former as a natural consequence, and when a tree is affected by drought insects are pretty sure to attack it, and death to the tree is sure to follow.

SALINE COUNTY.

(1.) Borers injure walnut (black). (2.) Borers cause the greatest trouble. Mr. J. F. Willington, of Salina, says: "Five years ago I drove four eightpenny nails in the roots of my trees, close up to the trunk, and since then I have had no trouble with borers." (3.) Borers give most trouble, and grasshoppers do injury in some seasons

SHERIDAN COUNTY.

(1.) Grasshoppers and mice are injurious. (2.) Grasshoppers do some injury. (3.) A large green worm injures cottonwoods, and rabbits do considerable damage.

SMITH COUNTY.

(1.) Worms injure cottonwoods. (2.) Borers do the most damage. (3.) Caterpillars, in the spring, do considerable injury. (4.) A small green worm and a striped bug do some injury. (5.) Borers and drought injure cottonwoods very much. (6.) Insects destroy cottonwoods and maples; grubs or borers are the most destructive to trees. (7.) Small ants suck the young and tender plants just after they come up, and kill many.

STAFFORD COUNTY.

(1.) Rabbits and grasshoppers are most injurious. (2.) The tobacco worm eats the leaves of cottonwoods. (3.) Hot winds crack the bark of trees, which is very injurious. (4.) Gophers and rabbits are very injurious. (5.) Borers kill a great many trees. (6.) Hail and wind storms are injurious to young trees, and grasshoppers in some seasons are damaging.

SUMNER COUNTY.

(1.) The flat-head borer injures a large number of trees. (2.) Borers have done considerable damage to box-elders, maples (soft), and cottonwoods, and maples (soft) suffer from sun-scald. (3.) The beetle or borer is injurious. (4.) Borers and sun-scald are the greatest difficulties. (5.) Borers are the worst enemies to box-elders and cottonwoods. (6.) Borers and other insects kill many trees. (7.) Sun-blight and borers are very damaging. (8.) Drought injures all soft wood, quick-growing trees at two or three years old.

TREGO COUNTY.

(1.) Grubworms at the roots cause many trees to die. (2.) Grasshoppers in some seasons are very injurious; they strip off the foliage and eat the young twigs. (3.) Grasshoppers, gray beetles and red ants are very injurious to trees.

WABAUNSEE COUNTY.

(1.) Borers give some trouble to maples (soft), cottonwoods, pine (Scotch), cedar (red), and box-elders. (2.) Worms injure the maples to some extent, and heavy winds split maples (soft) very badly. (3.) Borers kill locusts (black), cottonwoods and maples (soft). (4.) Borers and the hot winds seem to do the most damage. (5.) Borers and caterpillars do some damage.

WASHINGTON COUNTY.

(1.) The borers are very destructive. (2.) Rabbits are injurious to young trees. Grasshoppers are sometimes very damaging. (3.) Borers and rabbits do considerable

damage. (4.) Grasshoppers are injurious to some extent. (5.) Sun-scald and borers are injurious. (6.) Borers injure cottonwoods on high land. (7.) Heavy winds destroy trees. (8.) Borers, green and striped worms do considerable damage in this section. (9.) Sun-scald causes many trees to die.

WOODSON COUNTY.

(1.) The borers, hot winds, and sun are all more or less injurious to young trees. (2.) Maples (soft) are sometimes injured by the leaf worm. (3.) Maples (soft) are injured by borers. They cut into the wood under the bark, and large numbers die.

IV.—OTHER DIFFICULTIES OBSERVED IN ATTEMPTS AT TREE-PLANTING.

ALLEN COUNTY.

(1.) The principal difficulty is negligence after planting, leaving the trees to take care of themselves, without any cultivation. (2.) Planting those kinds not suited to soil or climate.

ATCHISON COUNTY.

(1.) General neglect and shiftlessness. (2.) Laziness and negligence.

BARBOUR COUNTY.

(1.) Prairie fires are serious difficulties.

BARTON COUNTY.

(1.) Dry weather is one great cause of failure.

CHEROKEE COUNTY.

(1.) Want of proper culture to keep down the weeds. (2.) Negligence and want of care.

CLOUD COUNTY.

(1.) Too close planting by some, not allowing room for cultivation. (2.) Dry weather and hot winds.

CRAWFORD COUNTY.

(1.) Planting trees that are too large. Planting inferior trees. Planting too late in the spring. (2.) Want of attention. (3.) Want of proper culture.

DECATUR COUNTY.

(1.) Drought is the greatest difficulty. (2.) Negligence and carelessness. (3.) High winds, which have a tendency to loosen the roots.

DICKINSON COUNTY.

(1.) Want of proper kinds of trees suited to soil and climate. (2.) Want of time at proper season for planting, as farmers are generally very busy when trees should be set. Want of seeds and lack of knowledge of tree culture. (3.) Dry seasons. (4.) Shiftless, slipshod planting and want of thorough preparation of the land before planting. (5.) Ignorance of the first principles of forestry and lack of cultivation and pruning. (6.) Dry weather and want of proper care.

DOUGLAS COUNTY.

(1.) Want of proper cultivation until trees can take care of themselves. (2.) Negligence in preparing the soil before planting, and want of proper attention and cultivation afterward.

EDWARDS COUNTY.

(1.) Drought and poor cultivation.

ELK COUNTY.

(1.) Negligence in culture. (2.) Sun-scalds on south side of trees. (3.) Carelessness. (4.) Trees are generally set straight up, when they should lean to the south at an angle of about 45 degrees. This protects them from the hot rays of the sun, and prevents sun scald, which causes so many to die. (5.) Lack of knowledge. Want of proper preparation of the soil, and impatience. (6.) Dry weather.

ELLIS COUNTY.

(1.) Dry weather. (2.) Want of knowledge as to the best trees to plant, preparation of the soil, mode of culture, and proper care. (3.) Hot winds and dry weather.

GOVE COUNTY.

(1.) Want of proper care and hot winds and dry weather.

GRAHAM COUNTY.

(1.) Negligence in preparing the soil properly before planting, and want of cultivation afterwards. (2.) Dry seasons. (3.) Not planting at proper time. (4.) Want of proper culture. (5.) Want of time to prepare the land properly; the "claim act" does not allow time enough te get the land subdued.

GRAY COUNTY.

(1.) Failure to prepare land properly. (2.) Cattle running at large.

HARVEY COUNTY.

(1.) Negligence on the part of farmers; high winds. (2.) Poor planting and poor cultivation. (3.) Planting trees before the land is subdued. (4.) Drought is very destructive.

JEFFERSON COUNTY.

(1.) Dry weather is a serious difficulty in the way of success in planting trees.

JEWELL COUNTY.

(1.) The "timber-culture act" requires trees to be planted too close. This is a serious difficulty, and should be remedied. (2.) Hot, dry weather.

JOHNSON COUNTY.

(1.) The hot sun scalds the trunk on the south and west sides. (2.) The extremes of climate are serious difficulties. (3.) Negligence, want of care in planting, and proper culture.

KINGMAN COUNTY.

(1.) Dry weather.

LABETTE COUNTY.

(1.) Dry weather in July and August. (2.) Heavy winds shake the trees and loosen the roots. (3.) Failure to put the ground in proper order, to cultivate properly, and to

mulch the trees in dry weather, and by setting too far apart. (4.) Dry seasons after planting. (5.) Dry, hot weather in July, August and September. (6.) Negligence. (7.) Extreme hot and dry weather.

LANE COUNTY.

(1.) Drought, and stock running at large. (2.) Planting trees too late; some plant just the day before the limitation in the "act" expires, to enable them to hold the claim, and they give no attention to culture of the trees.

LEAVENWORTH COUNTY.

(1.) Chiefly negligence, want of attention and proper culture.

LINCOLN COUNTY.

(1.) Dry weather in July and August are serious difficulties. (2.) Drought injures trees more than anything else.

LINN COUNTY.

(1.) Planting trees too deep. Hot sun in summer and sleet in winter are difficulties. (2.) Drought is the greatest difficulty. (3.) Want of energy.

LYON COUNTY.

(1.) Dry, hot weather in August and September. The sun blisters the bark, causing it to crack and peel off.

M'PHERSON COUNTY.

(1.) Failure to put land in proper condition before planting. (2.) Failing to subdue the land before planting, and hot, dry weather. (3.) Want of proper cultivation; dry seasons. (4.) Hot winds. (5.) Dry weather and careless planting.

MIAMI COUNTY.

(1.) Want of knowledge of tree-culture and of interest in its success. (2.) Dry seasons. (3.) Dry weather in latter part of summer.

MORRIS COUNTY.

(1.) Surface winds are great difficulties.

NEMAHA COUNTY.

(1.) Dry winds. (2.) Failure to cultivate properly. (3.) Want of knowledge as to the proper kinds of trees to plant and of mode of culture. (4.) Failure to prepare land properly before trees are planted.

NESS COUNTY.

(1.) Drought in spring. (2.) Dry weather. (3.) Drought, and planting trees too closely. (4.) Drought and hot winds in summer. (5.) Drought and want of proper cultivation. (6.) Planting before the land is subdued.

NORTON COUNTY.

(1.) Too dry climate and too close planting. (2.) Want of proper culture after trees are planted. (3.) Sun-scald.

OSBORN COUNTY.

(1.) Dry seasons is the main difficulty in this section.

OTTAWA COUNTY.

(1.) Dry winds in certain seasons. (2.) Failure to cultivate properly after planting and prairie fires. (3.) Dry weather in spring. (4.) Dry springs and want of sufficient moisture in the earth to keep the trees alive. (5.) Drought, heat and wind. (6.) Want of care in planting, dry seasons and want of proper culture.

PAWNEE COUNTY.

(1.) Want of proper care, lack of means and want of rain in certain seasons. (2.) Dry weather and want of moisture in the soil. (3.) Drought is the main difficulty.

PHILLIPS COUNTY.

(1.) Failure to cultivate properly. (2.) Want of knowledge in tree-culture, want of means and failure of proper attention after setting.

RENO COUNTY.

(1.) Strong south and southwest winds do considerable damage to young trees. (2.) Want of attention and proper cultivation. (3.) Sometimes the dry weather is a serious difficulty. (4.) Hot winds in August. (5.) Hot, dry weather and want of thorough cultivation. (6.) Too late planting. (7.) Failure to put the land in good condition before planting, lack of thorough cultivation so as to keep the weeds down and general carelessness. (8.) Hot, dry weather in July and August. (9.) Not knowing what kinds to plant and want of proper culture.

RICE COUNTY.

(1.) Want of rain. (2.) Careless planting and cultivation. (3.) Want of care. (4.) Want of knowledge as to planting and culture. (5.) Too late culture in summer, causing trees to grow late, when they winter-freeze. (6.) Planting out trees and expecting them to grow without cultivation. Some farmers act as if they thought Providence would attend to the culture after the trees are planted. (7.) Dry climate and hot south winds.

ROOKS COUNTY.

(1.) Dry weather is the greatest difficulty. (2.) Want of time to get land in proper condition; the law does not allow time enough. The land should be subdued and thoroughly pulverized; then trees will grow well. (3.) Failure to get good seeds and plants, and failure to set out and cultivate properly. (4.) Not planting at the proper time and want of cultivation. (5.) Planting too close and failing to cultivate. (6.) Want of knowledge in tree-culture among the people and want of care to young trees. (7.) "Lack of the patience of Job, and that eternal diligence necessary to success, is the difficulty here." (8.) Soil too new and thirsty. (9.) Want of cultivation after the trees are planted or set out.

RUSH COUNTY.

(1.) Dry weather and hot winds. (2.) Excessive dry seasons. (3.) Want of interest in preparing land and planting trees. (4.) Want of proper cultivation. (5.) Carelessness and laziness.

SALINE COUNTY.

(1.) Dry seasons. (2.) Want of interest in tree-planting; the object of some is more to secure land than to have a forest.

SHERIDAN COUNTY.

(1.) Dry weather and hot winds. (2.) The time allowed by the "timber-culture act" to get the land in proper condition for tree-planting is not sufficient, and is a difficulty of no small magnitude. (3.) Want of rain.

SMITH COUNTY.

(1.) In some sections there seems to be a hardpan or strata through which the roots cannot penetrate. (2.) Want of sufficient culture in pulverizing the soil before planting. (3.) Dry weather.

STAFFORD COUNTY.

(1.) Drought is the greatest difficulty. (2.) Failure to cultivate properly. (3.) Want of knowledge and experience in planting and cultivating trees. (4.) Not planting early enough, drought and want of cultivation. (5.) Careless culture. (6.) Want of proper preparation of the land and dry weather. (7.) Drought in early spring, before the young trees take root.

SUMNER COUNTY.

(1.) Failure to prepare the land properly, lack of care in cultivation and general ignorance of the whole subject. (2.) Negligence. (3.) Hot sun and dry weather. (4.) Want of time to put land in proper condition. (5.) Dry, hot weather in July and August. (6.) Wind-storms. (7.) Want of knowledge as to the kind best suited to the climate, when and how to plant the trees, and the proper cultivation to give them.

TREGO COUNTY.

(1.) Hot winds in summer and the dry climate. The land has not been in cultivation long enough to produce moisture in the earth; each successive year it is plowed deeper, and this creates moisture. (2.) Extreme dry climate and soil. (3.) Newness of land, not being in cultivation long enough to become subdued and pulverized.

WABAUNSEE COUNTY.

(1.) Dry weather. (2.) Want of interest in planting and the means to do it successfully. (3.) The time allowed by law is too short to get the land in good condition for tree-planting.

WASHINGTON COUNTY.

(1.) Want of care and proper cultivation. (2.) Shiftlessness and want of interest on the part of farmers. (3.) Carelessness in preparing the land for planting and cultivation. (4.) Want of time to prepare the land properly before planting.

WILSON COUNTY.

(1.) Laziness, and expecting forests to grow without labor.

WOODSON COUNTY.

(1.) Planting trees before the land is prepared. Dry weather, especially in July and August.

WYANDOTTE COUNTY.

(1.) Some trees are planted too shallow, and others too close together.

MINNESOTA.

I.—THE KINDS OF TREES, IN ORDER OF PREFERENCE, FOUND TO HAVE BEEN GROWN SUCCESSFULLY.

BECKER COUNTY.

(1.) Cottonwood, maple (soft), ash (white), box-elder, willow (white), oak (white), aspen, alder, basswood (or linden), elm (white).

BENTON COUNTY.

(1.) Oak (white), oak (red), oak (black), willow (white), box-elder, ironwood, ash (black), ash (yellow), ash (white), basswood (or linden), elm (white), elm (red), maple (soft), maple (hard), poplar (Lombardy) thorn (white).

BIGSTONE COUNTY.

(14.) Cottonwood, box-elder, ash (white), maple (soft), walnut (black), butternut (or white walnut), poplar (Lombardy), elm (white), willow (white), basswood (or linden) oak (burr), spruce (Norway), pine (Scotch), pine (white), ash (black), maple (hard), oak (red), catalpa, oak (white), hickory, hackberry, willow (diamond), arbor-vitæ, balsam fir.

BROWN COUNTY.

(3.) Cottonwood, maple (soft), box-elder, willow (white), walnut (black), ash (white), butternut (or white walnut), elm (red).

CLAY COUNTY.

(6.) Cottonwood, box-elder, elm (white), willow (white), ash (white), oak (white), ash (black), basswood (or linden), oak (burr), poplar (Lombardy), balsam fir, arbor-vitæ, spruce (Norway), elm (red), walnut (black), butternut (or white walnut), cherry, balm of Gilead, larch (European), pine (Scotch), maple (hard), ash (yellow).

DAKOTA COUNTY.

(3.) Cottonwood, maple (soft), larch (European), spruce (Norway), ash (white), pine (Scotch), willow (white), walnut (black), box-elder, butternut (or white walnut), maple (hard).

DODGE COUNTY.

(4.) Willow (white), maple (soft), cottonwood, poplar (Lombardy), elm (white), box-elder.

FARIBAULT COUNTY.

(12.) Willow (white), cottonwood, maple (soft), poplar (Lombardy), box-elder, ash (white), walnut (black), elm (white), butternut (or white walnut), hickory, oak (red), maple (hard), oak (white), oak (black), balm of Gilead, oak (burr), ash (black), locust (honey), elm (red), hackberry, basswood (or linden).

FILLMORE COUNTY.

(2.) Cottonwood, willow (white), balm of Gilead, box-elder, maple (soft), maple (hard), walnut (black), cherry, butternut (or white walnut), oak (red), ash (black), ash (white), locust (black), birch, oak (white), oak (burr), elm (red), pine (white), balsam fir, cedar (red), spruce (Norway), pine (Scotch), arbor-vitæ.

FREEBORN COUNTY.

(4.) Willow (white), cottonwood, maple (soft), box-elder, poplar (Lombardy), ash (white), elm (red), walnut (black), butternut (or white walnut), locust (honey), ash (black), cherry, basswood (or linden), maple (hard), tamarack, oak (bur), oak (black).

GOODHUE COUNTY.

(2.) Cottonwood, maple (soft), willow (white), box-elder, poplar (Lombardy), elm (white), elm (red), ash (white), ash (black), oak (white), oak (burr), walnut (black), pine (Scotch), pine (white), tamarack.

HOUSTON COUNTY.

(1.) Maple (soft), cottonwood, willow (white). This county borders on the Mississippi River where the natural forest extends 50 miles inland.

JACKSON COUNTY.

(5.) Cottonwood, maple (soft), willow (white), box-elder, ash (white), walnut (black), elm (white), oak (white), poplar (Lombardy), maple (hard), oak (black), mulberry, spruce (Norway), pine (Scotch), larch (European).

KANDIYOHI COUNTY.

(1.) Box-elder, cottonwood, poplar (Lombardy), willow (white), spruce (Norway).

LINCOLN COUNTY.

(5.) Cottonwood, box-elder, ash (white), willow (white), poplar (Lombardy), oak (white), oak (red), ash (black), walnut (black), butternut (or white walnut), maple (soft).

MARTIN COUNTY.

(17.) Cottonwood, willow (white), maple (soft), box-elder, ash (white), walnut (black), poplar (Lombardy), elm (white), tamarack, oak (white), hickory, butternut (or white walnut), maple (hard).

MURRAY COUNTY.

(8.) Cottonwood, willow (white), maple (soft), ash (white), box-elder, walnut (black), butternut (or white walnut), elm (white), alder, ash (black), elm (red).

NOBLES COUNTY.

(15.) Cottonwood, willow (white), box-elder, maple (soft), walnut (black), ash (white), poplar (Lombardy), elm (white), spruce (Norway), oak (white), oak (red), butternut (or white walnut), larch (European), balm of Gilead, maple (hard), elm (red), pine (Scotch), ash (black), locust (honey), Kentucky coffee, ailanthus.

OLMSTED COUNTY.

(8.) Willow (white), box-elder, cottonwood, maple (soft), ash (white), walnut (black), elm (white), butternut (or white walnut), pine (white), poplar (Lombardy), maple (hard), balm of Gilead, cedar (red), oak (white), arbor-vitæ, pine (Scotch), ash (black), oak (red), oak (burr), balsam fir, cherry, catalpa, larch (European), locust alder, spruce (Norway), basswood (or linden), birch, cedar (white), ironwood, Kentucky-coffee, thorn (white), hackberry, ash (prickly), mulberry, aspen.

PIPE STONE COUNTY.

(3.) Cottonwood, willow (white), ash (white), walnut, (black), maple (soft), butternut (or white walnut), box-elder, poplar (Lombardy), elm (white), elm (red), catalpa.

POLK COUNTY.

(1.) Cottonwood, box-elder, ash (white), maple (soft), elm (white).

REDWOOD COUNTY.

(11.) Cottonwood, willow (white), box-elder, ash (white), maple (soft), walnut (black), elm (white), poplar (Lombardy), oak (white), elm (red), willow (gray), hackberry, ash (black), butternut (or white walnut), spruce (Norway), balm of Gilead, aspen, basswood (or linden), ironwood.

RICE COUNTY.

(1.) Cottonwood, box-elder, maple (soft), balm of Gilead, ash (white), spruce (Norway), balsam fir, willow (white), maple (hard), butternut (or white walnut), hickory.

SIBLEY COUNTY.

(6.) Willow (white), cottonwood, maple (soft), box-elder, poplar (Lombardy), butternut (or white walnut), walnut (black), ash (white), locust (honey and black), basswood (or linden), elm (white).

STEARNS COUNTY.

(1.) Ash (white), box-elder, maple (soft), cottonwood.

STEELE COUNTY.

(4.) Cottonwood, willow (white), maple (soft), box-elder, ash (white), maple (hard), poplar (Lombardy), elm (white), ash (green), basswood (or linden), walnut (black), larch (European), spruce (Norway), balsam fir, pine (Scotch), pine (white), cedar (red).

STEVENS COUNTY.

(6.) Cottonwood, willow (white), box-elder, ash (white), maple (soft), walnut (black), poplar (Lombardy), oak (white), oak (red), ash (black), elm (white), butternut (or white walnut), basswood (or linden), hackberry, maple (hard), larch (European), spruce (Norway), balsam fir.

TRAVERSE COUNTY.

(3.) Willow (white), cottonwood, maple (soft), box-elder, ash (white), butternut (or white walnut).

WASECA COUNTY.

(3) Cottonwood, willow (white), maple (soft), box-elder, poplar (Lombardy), maple (hard), walnut (black), butternut (or white walnut).

WILKIN COUNTY.

(6.) Cottonwood, box-elder, ash (white), willow (white), maple (soft), spruce (Norway), balm of Gilead, oak (white), oak (red), elm (white), poplar (Lombardy), balsam fir, basswood (or linden), catalpa.

WINONA COUNTY.

(6.) Cottonwood, maple (soft), willow (white), poplar (Lombardy), walnut (black), maple (hard), elm (white), pine (Scotch), spruce (Norway), box-elder, ash (white), pine (white), larch (European), ash (black), hickory, balsam fir, cedar (red), Osage orange, elm (red), chestnut, butternut (or white walnut), locust, balm of Gilead, arbor-vitæ, oak (white), tamarack.

WRIGHT COUNTY.

(1.) Box-elder, maple (soft), maple (hard), elm (white), ash (white), ash (black), poplar (Lombardy), spruce (Norway), balsam fir, pine (Scotch).

YELLOW MEDICINE COUNTY.

(9.) Cotton-wood, maple (soft), box-elder, willow (white), ash (white), poplar (Lombardy), elm (white), elm (red), maple (hard), balm of Gilead, oak (white).

SUMMARY.

Fifty-four kinds of trees are reported from the State at large. In order of preference, the leading varieties are as follows:

(1.) Cottonwood, (2.) willow (white), (3.) maple (soft), (4.) box-elder, (5.) ash (white), (6.) poplar (Lombardy), (7.) walnut (black), (8.) elm (white), (9.) butternut (or white walnut), (10.) oak (white), (11.) ash (black), (12.) maple (hard), (13.) spruce (Norway), (14.) oak (red), (15.) basswood (or linden), (16.) elm (red), (17.) hickory, (18.) oak (burr), (19.) hackberry, (20.) balm of Gilead, (21.) larch (European), (22.) pine (Scotch), (23.) pine (white), (24.) balsam fir, (25.) locust (honey), (26.) cherry, (27.) cedar (red).

II.—THE KINDS TRIED WHICH PROVED UNSUCCESSFUL.

BECKER COUNTY.

(1.) From its peculiar formation and tender limbs, high winds and storms are fatal to maple (soft).

BIG STONE COUNTY.

(7.) The soil is too dry and thirsty for larch (European), spruce (Norway), and the pines. Catalpa, walnut (black), locusts, butternut (or white walnut), and willow (white) all die in hard freezes during winter.

BROWN COUNTY.

(3.) Poplar (Lombardy) starts off well and seems to be thrifty, but dies in six or eight years. The evergreens and maple (hard) are killed by winter. They cannot stand heavy freezes.

CLAY COUNTY.

(5.) The larches, pines, spruce (Norway), chestnut and yew are unsuited to the soil. There does not appear to be enough sand or gravel in the soil for them. Walnut (black), the locusts, butternut (or white walnut), maple (soft), ash (white), and elm (white) die from the effect of hard freezes in winter.

DAKOTA COUNTY.

(1.) Poplar (Lombardy) is short-lived. It does not seem to be sound, in a few years begins to wither at the top, and soon the whole tree dies.

DODGE COUNTY.

(2.) The locusts (honey and black) are killed by winter. Poplar (Lombardy) is short-lived and not healthy; it begins to decay at the top in six or eight years.

FARIBAULT COUNTY.

(6.) Balm of Gilead is too brittle; wind storms break it badly. Poplar (Lombardy) and the locusts are short-lived; cause not accounted for. Osage orange dies in winter.

FILLMORE COUNTY.

(1.) Poplar (Lombardy) is short-lived, and dies in a few years. Willow (white) is winter-killed.

FREEBORN COUNTY.

(3.) Locusts (honey and black), willow (white), poplar (Lombardy), balm of Gilead, and cottonwood (yellow) die in hard, cold winters.

GOODHUE COUNTY.

(2.) Walnut (black), locusts (honey and black), poplar (Lombardy), ash (white), chestnut, maple (hard), and beech cannot stand hard freezes.

GRANT COUNTY.

(2.) Poplar (Lombardy) is short-lived, and exists but a few years. All the evergreens fail; they are not suited either to soil or climate, or maybe both combined.

JACKSON COUNTY.

(2.) Poplar (Lombardy) commences to decay at the top when six or eight years old, and very soon the whole tree dies. The evergreens are not acclimated, and consequently do not succeed.

KANDIYOHI COUNTY.

(1.) Spruce (Norway) dies from effects of dry weather and hot sun in summer.

LINCOLN COUNTY.

(3.) Elm (red) and maple (soft) are killed by hard freezes. These trees are tender; they break and split badly in wind storms.

MARTIN COUNTY.

(10.) Poplar (Lombardy) is short-lived, and dies out in about ten years. Evergreens are not suited to the soil; there is not enough sand or gravel to grow them successfully. Walnut (black), ash (white), and cottonwood (yellow) are killed by worms, or grubs, and caterpillars. Locusts, butternut (or white walnut), willow (white), and maple (soft) are all killed by winter; they cannot stand hard freezes.

MURRAY COUNTY.

(2.) Hickory is killed by worms or borers. Poplar (Lombardy) is short-lived. Walnut (black), willow (white), and maple (soft) are winter-killed.

NOBLES COUNTY.

(6.) Poplar (Lombardy) lives only a few years; it decays at the top first; then the tree soon dies. The larches, spruce (Norway), chestnuts, and the evergreens cannot stand the extremes of climate. Catalpa, the locusts, ailanthus, magnolia, maple (soft), elm (white), balm of Gilead and Osage orange are all killed by winter.

OLMSTED COUNTY.

(4.) Poplar (Lombardy) is not hardy; it lives but a few years. Locust (black) is destroyed by worms or borers, and walnut (black), butternut (or white walnut), and maples (soft and hard) are killed by hard freezes in winter.

PIPE STONE COUNTY.

(2.) The evergreens cannot stand the dry, hot weather in summer.

REDWOOD COUNTY.

(6.) Poplar (Lombardy) is short-lived; maple (soft) breaks and splits badly in wind storms, and sometimes freezes in winter; hickory, walnut (black), spruce (Norway), butternut (or white walnut), maple (hard), and ash (white) are killed in very severe winters; they survive ordinary winters however.

RICE COUNTY.

(1.) Poplar (Lombardy) is short-lived, growing well and thrifty for ten or twelve years, and then begins to decay at the top. No conclusion of the cause has been arrived at, but the decay appears to be universal.

SIBLEY COUNTY.

(2.) Poplar (Lombardy) winter-kills, and is generally short-lived Locust (black) is also killed by winter and affected by borers.

STEARNS COUNTY.

(1.) Willows (white) are subject to worms, which kill them.

STEELE COUNTY.

(1.) Poplar (Lombardy) does well for five to eight years, and then dies.

STEVENS COUNTY.

(1.) Box-elder and maple (soft) cannot stand hard freezes, and the former is very inferior in all respects. Poplar (Lombardy) winter kills in some seasons, and generally is short lived.

WASECA COUNTY.

(1.) Locusts (black) are infested with borers; they cut the wood so badly the trees nearly all die.

WILKIN COUNTY.

(3.) Mulberry (Russian), walnut (black), butternut (or white walnut), and maple (soft) cannot stand the hard winter freezes.

WINONA COUNTY.

(3.) Locusts (black) are killed by borers and hard freezes. Pines are affected by extremes of heat and cold. Maples (hard), chestnuts, basswood (or lindens), and O orange are all winter-killed.

YELLOW MEDICINE COUNTY.

(3.) Larches (European), mulberry (Russian), spruce (Norway), locust (black), and willow (white), are all killed by winter. The locusts are destroyed by borers, and poplars (Lombardy) are short-lived.

SUMMARY.

Twenty-seven kinds of trees are mentioned as having been tried which did not prove successful. The following is the list and the number of times each is stated in the reports: Poplar (Lombardy), 19; locust (black), 13; maple (soft), 10; walnut (black), 9; maple (hard), 7; willow (white), 7; butternut (or white walnut), 6; the evergreens, 6; the oaks, 6; spruce (Norway), 6; ash (white), 4; chestnut, 4; larch (European), 4; balm of Gilead, 3; elm (white), 3; hickory, 3; Osage orange, 3; pines, 3; catalpa, 2; cottonwood (yellow), 2; mulberry (Russian), 2; and ailanthus, basswood (or linden), beech, box-elder, magnolia, and yew, each once.

III.—THE INJURES NOTICED TO HAVE OCCURRED FROM INSECTS OR OTHER CAUSES.

BECKER COUNTY.

(1.) A very small green worm eats the leaves of cottonwoods, causing some injury. Gophers and rabbits are destructive to young trees. (2.) Rabbits girdle young trees in winter.

BENTON COUNTY.

(1.) The cut-worm hurts the oaks. It cuts the young plants soon after they come through the ground.

BIG STONE COUNTY.

(1.) Rabbits girdle the young trees in the snow. (2.) Grasshoppers are injurious (3.) The ants injure maples (soft) by sucking the sap just above the ground. Willows (white) are injured by worms eating the leaves, and rabbits do much injury by eating the bark. (4.) Grasshoppers are sometimes very destructive. (5.) Ash (white) is sometimes troubled by large green worms eating the leaves. (6.) The ash (white) is injured by borers. They cut the wood so badly that when the wind blows hard the trees break off.

BROWN COUNTY.

(1.) The cabbage, or cut-worms, are very destructive to young tree-plants, just as they come up. Maple (soft) seems to suffer most in this respect. (2.) June bugs injure cottonwoods in the month of June, and willows (white) are attacked by a small worm. (3.) Grasshoppers do great injury to all kinds of trees.

CLAY COUNTY.

(1.) Rabbits injure young trees very much. (2.) The black caterpillar injures willows (white). (3.) Grasshoppers are sometimes so numerous they do great injury to forests by eating the leaves and twigs.

DODGE COUNTY.

(1.) Caterpillars injure willows (white) by eating the leaves, which exposes the limbs to the hot sun.

FARIBAULT COUNTY.

(1.) Worms or caterpillars eat the leaves of willows (white). (2.) Grasshoppers are injurious to some extent. (3.) Willows (white) are injured by black caterpillars or worms. A large white grub or borer does considerable damage during the month of August. In May a large wasp-like fly, nearly two inches in length, cuts around the top limbs where they are about one inch in diameter, causing them to break off in windy weather. (4.) Grubs or borers sometimes seriously injure the cottonwoods and poplars (Lombardy), by cutting or boring to the center or heart of the tree. (5.) Cattle are very destructive to young trees.

FILLMORE COUNTY.

(1.) Locusts sometimes deposit their eggs in the last year's growth of the limbs, and this often causes the tree to die.

FREEBORN COUNTY.

(1.) Worms and caterpillars injure willows (white) by eating off the leaves.

GOODHUE COUNTY.

(1.) A white grub or borer kills box-elders and maples (soft) by cutting or boring into the trunks of the tree.

GRANT COUNTY.

(1.) Rabbits are very injurious to trees in winter; they cut the bark just above the ground.

JACKSON COUNTY.

(1.) Grasshoppers do great injury to trees. (2.) Heavy snows in the winter of 1880–'81 injured trees.

KANDIYOHI COUNTY.

(2.) The beetle in large numbers attacks the cottonwoods and does great injury.

LINCOLN COUNTY.

(1.) Some species of worm or insect frequently cuts the tap-root of ash (white) about 2 inches below the surface, which injures them very much. (2.) Caterpillars, or worms frequently eat the leaves of willows (white), but no injury is perceptible. (3.) A white grub or worm bores into ash (white), causing it to break off in wind storms. (4.) Millions of white and black worms eat the foliage of willows (white), which retards their growth.

MARTIN COUNTY.

(1.) Grasshoppers have caused some injury. (2.) Grasshoppers have done much damage to maple (soft) and ash (white). (3.) Ash (white) is very often infested

with grubs or borers that cut into the trunk, from which it dies. (4.) In 1874 and 1875, the locusts or grasshoppers did great damage. (5.) Rabbits cause the greatest trouble. (6.) Grasshoppers do some injury. (7.) Worms attack willows (white) in dry seasons. (8.) Walnuts (black) are sometimes attacked by worms that eat the leaves, causing some injury.

MURRAY COUNTY.

(1.) A worm sometimes attacks the tender shoots or twigs of box-elder. (2.) Grasshoppers or locusts are the only insects in this section that do any injury. (3.) Caterpillars are injurious to willows (white). There is also a glossy black fly that girdles the willows (white), causing them to break off in strong winds.

NOBLES COUNTY.

(1.) A large white worm injures willows (white), and a green worm attacks box-elder and maple (soft). (2.) Worms injure willows (white). (3.) A large green worm injures box-elder, ash (white), and sometimes the cottonwoods. (4.) Gophers injure trees by cutting the roots. (5.) A species of louse sometimes injures the cottonwoods. (6.) Some seasons the grasshoppers are injurious. (7.) A white worm or grub occasionally injures ash (white) by cutting into the pith or heart.

OLMSTED COUNTY.

(1.) Worms strip the willows (white) of their leaves. (2.) Want of mulching in dry weather and heavy winds are injurious to trees. (3.) Sapsuckers, or woodpeckers are very damaging to pine (Scotch). (4.) The borers sometimes attack maple (soft) and ash (white).

PIPE STONE COUNTY.

(1.) Worms eat the willows (white), but do no material injury. (2.) Early or late frosts injure cottonwoods. (3.) Grasshoppers have done much damage, and hail-storms are injurious.

REDWOOD COUNTY.

(1.) Grasshoppers from 1873 to 1878 destroyed nearly all the young trees. A large green worm, from three to four inches long, injures ash (white). (2.) Worms eat the leaves from willows (white), causing some injury. (3). Surface water, when allowed to stand too long, is injurious to trees. (4.) Borers attack ash (white) and worms injure willows (white). (5.) Grasshoppers cause the only trouble.

RICE COUNTY.

(1.) Gophers do considerable injury to trees by cutting the roots, and caterpillars work some damage.

SIBLEY COUNTY.

(1.) Borers injure willows (white) by cutting into the trunk, causing them to break. Caterpillars eat the leaves.

STEELE COUNTY.

(1.) Borers or grubs injure ash (white) by cutting into the trunk.

STEVENS COUNTY.

(1.) Caterpillars are injurious to willows (white).

TRAVERSE COUNTY.

(1.) Dry winds in spring and spring frosts are injurious.

WASECA COUNTY.

(1.) The cut or cabbage worms are sometimes very destructive to maples (soft) just as the young plants are coming up.

WILKIN COUNTY.

(1.) Willow-worms eat the leaves. (2.) A black fly eats the leaves of willows (white), causing some injury.

WINONA COUNTY.

(1.) Borers in locusts (black) and maple (soft) are very injurious. (2.) Sapsuckers hurt the trees.

YELLOW MEDICINE COUNTY.

(1.) Some kind of insect works under the roots into the heart or pith of trees, causing many to die. (2.) Worms eat the leaves of willows (white), but no particular injury results. (3.) Grasshoppers have done some damage. (4.) Rabbits injure trees in winter.

IV.—OTHER DIFFICULTIES OBSERVED IN ATTEMPTS AT TREE-PLANTING.

BECKER COUNTY.

(1.) The latitude is so far north it is difficult to get trees to grow on high, sandy soil; consequently, low, damp land is sought after. Severe droughts are difficulties. (2.) Floods or droughts, when trees are young, are disastrous.

BENTON COUNTY.

(1.) Dry weather in the spring is a serious difficulty.

BIG STONE COUNTY.

(1.) Selecting inferior seeds and plants. (2.) Planting too late in the fall. (3.) Allowing the grass to overcome the young trees. (4.) Want of care in selecting seeds and plants. (5.) Planting too late in spring. (6.) Failure to prepare the land properly. (7.) Want of proper care and cultivation after planting; dry weather in spring before the trees take root, and heavy winds and hard, cold winters.

BROWN COUNTY.

(1.) Carelessness in planting, and want of attention and proper cultivation.

CLAY COUNTY.

(1.) Lack of knowledge and interest in tree-planting. (2.) Want of proper preparation of the soil before planting; also, dry springs, too little cultivation in the spring, and too much cultivation late in the summer. The latter causes the trees to grow too late, and they winter-kill.

DODGE COUNTY.

(1.) Drought is the principal difficulty in this section.

FARIBAULT COUNTY.

(1.) Drought and weeds are serious difficulties. (2.) Dry seasons and poor cultivation. (3.) Want of care in planting and cultivation. (4.) Want of preparation of the soil before planting, and failure of proper cultivation.

FREEBORN COUNTY.

(1.) Drought in July and August are the principal difficulties. (2.) Late planting and poor cultivation. (3.) Want of proper cultivation after planting.

GOODHUE COUNTY.

(1.) Want of attention and proper cultivation.

GRANT COUNTY.

(1.) Want of proper care, attention and cultivation.

JACKSON COUNTY.

(1.) Planting trees before the land is in proper condition.

KANDIYOHI COUNTY.

(1.) Want of attention and the proper cultivation.

LINCOLN COUNTY.

(1.) Planting trees before the soil is prepared.

MARTIN COUNTY.

(1.) Prairie fires are great difficulties. (2.) Dry weather in spring and early summer. (3.) Planting before the soil is prepared, and want of cultivation. (4.) Planting trees that are too large. (5.) Dry weather in May. (6.) Heavy snows. (7.) Prairie fires and drought. (8.) Dry season in May and June, and cultivating too late in summer. (9.) Setting trees too close together, and want of care and attention.

MURRAY COUNTY.

(1.) Dry weather and late planting in spring. (2.) Drought in spring after planting. (3.) Planting or setting trees too thickly.

NOBLES COUNTY.

(1.) Want of proper attention and cultivation the first season. (2.) Severe winters and prairie fires. (3.) Want of thorough preparation of soil before planting, and proper cultivation to keep down the weeds.

OLMSTED COUNTY.

(1.) Late and shallow planting. (2.) Planting out of season, mostly too early in spring.

PIPE STONE COUNTY.

(1.) Dry weather. (2.) Negligence after trees are planted.

REDWOOD COUNTY.

(1.) Drought, fires and stock are the worst difficulties. (2.) Dry, hot weather in July and August. (3.) Want of proper cultivation. (4.) Drought in some seasons, and too much rain at other times. (5.) Late planting and want of proper cultivation.

STEELE COUNTY.

(1.) Drought, and want of proper cultivation of young trees.

STEVENS COUNTY.

(1.) Want of thorough preparation of the land before planting, and setting trees too closely together.

TRAVERSE COUNTY.

(1.) Dry winds in May are a great difficulty in this region.

WASECA COUNTY.

(1.) Setting trees too late in spring is a serious difficulty, because the dry season usually sets in before the young trees take root sufficiently to stand the drought.

WILKIN COUNTY.

(1.) Drought. (2.) Setting trees and cuttings that have been taken up, or cut too long without being protected, so as to keep them moist.

WINONA COUNTY.

(1.) Lack of interest and careless planting. (2.) Fall planting. (3.) Planting trees on land before it is subdued, and general neglect and want of proper cultivation after planting.

YELLOW MEDICINE COUNTY.

(1.) Dry weather in the spring, and planting seeds too closely. (2.) Planting too late in spring; the plants are killed by drought. (3.) Want of cultivation. (4.) Dry seasons and severe snow-storms.

NEBRASKA.

I.—THE KINDS OF TREES IN ORDER OF PREFERENCE FOUND TO HAVE BEEN GROWN SUCCESSFULLY.

ADAMS COUNTY.

(2.) Catalpa, cottonwood, ash (white), maple (soft), maple (hard), walnut (black), elm (white), mulberry (Russian), willow (white), box-elder, ash (green), elm (red), mulberry (native), beech, Kentucky coffee, cedar (red), pine (Austrian), pine (Scotch), pine (white), spruce (Norway), locust (honey), locust (black), arbor-vitæ, poplar, Osage orange.

ANTELOPE COUNTY.

(2.) Box-elder, cottonwood, ash (white), maple (soft), willow (white), walnut (black).

BOONE COUNTY.

(2.) Cottonwood, box-elder, willow (white), ash (white), catalpa, elm (white), walnut (black), poplar (Lombardy), cedar (red), oak (scrub).

BUFFALO COUNTY.

(5.) Cottonwood, box-elder, maple (soft), ash (white), elm (white), walnut (black), maple (hard), elm (red), ailanthus, hackberry, willow (white), cedar (red), locust (honey), Osage orange.

BURT COUNTY.

(4.) Walnut (black), box-elder, ash (white), maple (soft), cottonwood, catalpa, elm (white), oak (white), oak (red), oak (burr), willow (white), willow (red), elm (red), locust (honey), hickory, locust (black), maple (hard), chestnut, horse chestnut, birch, larch (European), pine (white), spruce (Norway), balsam fir.

BUTLER COUNTY.

(10.) Cottonwood, ash (white), walnut (black), maple (soft), box-elder, elm (white), catalpa, willow (white), elm (red), locust (honey), cedar (red), oak (burr), maple (hard), mulberry (Russian), pine (Scotch), pine (Austrian), willow (red), Kentucky coffee, ailanthus, poplar (Lombardy), oak (white), oak (red), cherry, hackberry, locust (black), basswood (or linden), ash (green), pine (white), spruce (Norway), sycamore, balsam fir, willow (weeping), dogwood, butternut (or white walnut), balm of Gilead, arbor-vitæ, mulberry (native), pecan, persimmon.

CASS COUNTY.

(8) Cottonwood, ash (white), walnut (black), maple (soft), box-elder, elm (white), elm (red), oak (burr), willow (white), cedar (red), spruce (Norway), locust (honey), mulberry (native), oak (red), hickory, hackberry, catalpa, pine (Scotch), pine (white), pine (Austrian), balsam fir, larch (European), basswood (or linden), oak (white), oak (scrub), poplar (Lombardy), cedar (white), arbor-vitæ, maple (hard), Kentucky coffee, locust (black), willow (red), Osage orange, mulberry (Russian), ash (green).

CEDAR COUNTY.

(3.) Cottonwood, box-elder, walnut (black), ash (white), maple (soft), elm (white), basswood, (or linden), catalpa, oak (burr), oak (scrub), locust (black), cedar (red), mulberry (Russian), willow (red), balm of Gilead, willow (white).

CLAY COUNTY.

(7.) Cottonwood, box-elder, ash (white), walnut (black), elm (white), willow (white), locust (honey), poplar (Lombardy), locust (black), maple (soft), oak (white), willow (red), maple (hard), catalpa, ash (black), elm (red), mulberry (Russian), mulberry (native), cedar (red), oak (red), oak (burr), butternut (or white walnut), hickory, chestnut, beech, birch, basswood (or linden), ailanthus.

COLFAX COUNTY.

(3.) Cottonwood, walnut (black), ash (white), maple (soft), box-elder, willow (white), willow (red), locust (honey), elm (white), hackberry, catalpa, elm (red), cherry (black), cedar (red), arbor-vitæ, cedar (white), pine (white) maple (hard), beech, mulberry (native), locust (black).

CUMING COUNTY.

(6.) Cottonwood, willow (white), box-elder, ash (white), maple (soft), walnut (black), willow (red), oak (white), catalpa, oak (red), locust (black), locust (honey), hackberry, spruce (Norway), balsam fir, larch (European), elm (red), arbor-vitæ, cedar (red), elm (white), oak (scrub), poplar (Lombardy).

CUSTER COUNTY.

(8.) Ash (white), box-elder, cottonwood, maple (soft), walnut (black), hackberry, willow (white), elm (white), locust (honey), butternut (or white walnut), cedar (red), catalpa, hickory, maple (hard), willow (weeping), locust (black), balm of Gilead, poplar (Lombardy), oak (burr), oak (red).

DAWSON COUNTY.

(1.) Cottonwood, box-elder, walnut (black), maple (soft), locust (honey), ash (white), elm (white), poplar (Lombardy), Kentucky coffee, locust (black), catalpa, ash (green).

DIXON COUNTY.

(1.) Walnut (black), oak (white), hackberry, ash (white), mulberry (Russian), elm (red), elm (white), box-elder, cottonwood, willow (white), willow (red).

DODGE COUNTY.

(1.) Walnut (black), box-elder, maple (soft), cottonwood, ash (white), elm (red), Kentucky coffee.

DOUGLAS COUNTY.

(4.) Cottonwood, maple (soft), box-elder, walnut (black), ash (white), willow (white), ash (green), elm (red), maple (hard), cedar (red), locust (black), Kentucky coffee, spruce (Norway), catalpa, beech, elm (white), willow (red), poplar (Lombardy), Osage orange, hickory, larch (European), ailanthus, oak (burr), locust (honey), mulberry (native), pine (Austrian), pine (Scotch), pine (white).

FILLMORE COUNTY.

(6.) Cottonwood, box-elder, ash (white), walnut (black), catalpa, maple (soft), willow (white), locust (honey), elm (white), Osage orange, hackberry, mulberry (Russian), ash (green), elm (red).

FRANKLIN COUNTY.

(7.) Ash (white), walnut (black), locust (honey), box-elder, cottonwood, elm (white), maple (soft), willow (white), mulberry (Russian), mulberry (native), maple (hard), Kentucky coffee, elm (red), Osage orange, catalpa, ailanthus, sycamore.

FRONTIER COUNTY.

(1.) Locust (honey), walnut (black).

FURNAS COUNTY.

(11.) Cottonwood, ash (white), box-elder, walnut (black), elm (white), maple (soft), hackberry, willow (white), locust (honey), ash (green), catalpa, locust (black), oak (white), maple (hard), poplar (Lombardy), elm (red), Osage orange, larch (European), ailanthus, Kentucky coffee, cedar (red), pine (Scotch), redbud.

GAGE COUNTY.

(1.) Cottonwood, poplar (Lombardy), willow (white), Osage orange.

GREELEY COUNTY.

(4.) Box-elder, cottonwood, ash (white), walnut (black), catalpa, elm (white), locust (black), willow (white), elm (red), poplar (Lombardy), butternut (or white walnut), cherry, locust (honey), hackberry.

HALL COUNTY.

(10.) Walnut (black), box-elder, ash (white), cottonwood, maple (soft), locust (honey), elm (white), catalpa, ash (green), butternut (or white walnut), willow (white), locust (black), elm (red), mulberry (native), Osage orange, poplar (Lombardy), hickory, mulberry (Russian), willow (red), Kentucky coffee, beech, maple (hard), birch, cedar (red), ailanthus, oak (burr), cherry, chestnut, basswood (or linden), pine (Austrian), pine (Scotch), pine (white), spruce (Norway), arbor-vitæ, larch (European).

HAMILTON COUNTY.

(4.) Willow (white), cottonwood, box-elder, walnut (black), ash (white), Osage orange, locust (honey), maple (soft), catalpa, balm of Gilead, pine (Scotch), pine (Austrian), poplar (Lombardy), mulberry (native), mulberry (Russian), maple (hard), elm (white), birch, chestnut, hackberry, oak (burr), oak (white), Kentucky coffee, cedar (red).

HITCHCOCK COUNTY.

(1.) Cottonwood, maple (soft), walnut (black), catalpa, box-elder, ash (white).

JEFFERSON COUNTY.

(5.) Catalpa, walnut (black), mulberry (Russian), ash (white), maple (soft), cottonwood, box-elder, locust (honey), maple (hard), hackberry, butternut (or white walnut), Kentucky coffee, elm (red), willow (white), sycamore, basswood (or linden), oak (burr), poplar (Lombardy), cedar (red), balsam fir, pine (Austrian), pine (Scotch), pine (white), mulberry (native), hickory, Osage orange, arbor-vitæ, locust (black).

JOHNSON COUNTY.

(5.) Walnut (black), maple (soft), box-elder, ash (white), cottonwood, locust (honey), elm (red), elm (white), Kentucky coffee, oak (red), willow (white), catalpa, Osage orange, locust (black), pine (Scotch), pine (white), poplar (Lombardy), oak (burr), willow (weeping), hickory, chestnut, spruce (Norway), mulberry (Russian), arbor-vitæ, sycamore.

KEITH COUNTY.

(1.) Cottonwood, ash (white), box-elder, maple (soft), maple (hard), walnut (black), pine (white), cedar (red).

LANCASTER COUNTY.

(6.) Walnut (black), ash (white), maple (soft), box-elder, elm (red), locust (honey), elm (white) catalpa, cottonwood, butternut (or white walnut), ailanthus, willow (white), Osage orange, cedar (red), pine (Austrian), pine (white), spruce (Norway), mulberry (Russian), maple (hard), ash (green), oak (white), chestnut, locust (black), oak (burr), cherry, redbud, hackberry.

LINCOLN COUNTY.

(1.) Cottonwood, maple (soft), ash (white), hackberry, elm (white), box-elder, walnut (black), ash (green), mulberry (Russian), cedar (red), chestnut.

MADISON COUNTY.

(7.) Ash (white), cottonwood, box-elder, walnut (black), maple (soft), willow (white), elm (white), oak (white), butternut (or white walnut), hickory, maple (hard).

MERRICK COUNTY.

(12.) Cottonwood, ash (white), box-elder, willow (white), maple (soft), elm (white), catalpa, walnut (black), locust (honey), poplar (Lombardy), cedar (red), locust (black), pine (Austrian), pine (Scotch), pine (white), spruce (Norway), maple (hard), mulberry (Russian), elm (red), willow (red), oak (white), oak (burr), chestnut, oak (red), basswood (or linden), sycamore, ash (green), butternut (or white walnut).

NANCE COUNTY.

(3.) Cottonwood, box-elder, walnut (black), hackberry, catalpa, maple (soft), elm (white), elm (red), maple (hard), willow (white), locust (honey), basswood (or linden), cedar (red), ash (white), oak (burr), Kentucky coffee, cherry.

NEMAHA COUNTY.

(12.) Walnut (black), ash (white), cottonwood, box-elder, maple (soft), catalpa, locust (honey), Osage orange, locust (black), elm (white), mulberry (Russian), maple (hard), oak (white), oak (burr), chestnut, hickory, butternut (or white walnut), hackberry, pine (white), poplar (Lombardy), ailanthus, basswood (or linden), elm (red), cedar (red), Kentucky coffee, willow (white), oak (red), ash (green), cherry, sycamore.

OTOE COUNTY.

(1.) Box-elder, cottonwood, maple (soft), mulberry (Russian), catalpa, locust (honey), walnut (black), willow (white), Kentucky coffee, ash (white), elm (red), hickory.

PAWNEE COUNTY.

(3.) Walnut (black), maple (soft), oak (burr), elm (red), locust (honey), ash (white), willow (white), cottonwood, oak (red), elm (white), locust (black), mulberry (Russian), hickory, Kentucky coffee, hackberry, catalpa, cedar (red), pine (white), pine (Scotch), pine (Austrian), spruce (Norway), larch (European), Osage orange, box-elder.

PHELPS COUNTY.

(4.) Cottonwood, ash (white), box-elder, walnut (black), maple (soft), elm (white), willow (white), mulberry (Russian), catalpa, locust (black), locust (honey), cherry, poplar (Lombardy), beech, cedar (red), hackberry.

PLATTE COUNTY.

(10.) Cottonwood, ash (white), box-elder, walnut (black), maple (soft), locust (honey), elm (white), catalpa, elm (red), hackberry, willow (white), mulberry (Russian), poplar (Lombardy), oak (white), cedar (red), maple (hard), ash (green), hickory, dogwood, pine (Austrian), pine (Scotch), pine (white), spruce (Norway), locust (black), ailanthus, cherry, sycamore, Kentucky coffee, beech, arbor-vitæ, willow (weeping), butternut (or white walnut), redbud, birch.

POLK COUNTY.

(4.) Box-elder, ash (white), cottonwood, walnut (black), catalpa, maple (soft), willow (white), elm (white), hackberry, cedar (red), locust (honey), oak (burr).

RED WILLOW COUNTY.

(9.) Cottonwood, walnut (black), ash (white), box-elder, hackberry, elm (white), oak (white), maple (soft), locust (honey), hickory, willow (white).

RICHARDSON COUNTY.

(1.) Ash (white), walnut (black), maple (soft), cottonwood, elm (white), elm (red), box-elder, mulberry (Russian), oak (burr), hickory, catalpa, pine (white), pine (Scotch), pine (Austrian), spruce (Norway), arbor-vitæ.

SALINE COUNTY.

(4.) Cottonwood, maple (soft), box-elder, walnut (black), ash (white) locust (honey), willow (white), catalpa, hackberry, mulberry (Russian), ash (green), elm (white), maple (hard), Kentucky coffee, redbud, oak (white), hickory.

SARPY COUNTY.

(12.) Cottonwood, box-elder, walnut (black), maple (soft), ash (white), elm (white), locust (honey), hickory, butternut (or white walnut), oak (white), elm (red), willow (white), locust (black), hackberry, poplar (Lombardy), cedar (red), pine (white), pine (Austrian), pine (Scotch), basswood (or linden), oak (red), Osage orange, Kentucky coffee, larch (European), cherry, sycamore, ash (green), oak (burr), spruce (Norway), maple (hard).

SAUNDERS COUNTY.

(7.) Cottonwood, box-elder, walnut (black), maple (soft), ash (white), elm (white), willow (white), catalpa, elm (red), hickory, locust (honey), locust (black), basswood (or linden), oak (burr), oak (white), hackberry, poplar (Lombardy), maple (hard), Osage orange.

SEWARD COUNTY.

(20.) Cottonwood, box-elder, ash (white), walnut (black), maple (soft), elm (white), locust (honey), willow (white), catalpa, elm (red), hackberry, oak (white), oak (burr), hickory, butternut (or white walnut), poplar (Lombardy), Osage orange, cedar (red), spruce (Norway), locust (black), mulberry (native), mulberry (Russian), cherry, basswood (or linden), cedar (white), ash (green), balm of Gilead, pine (white), chestnut, ailanthus.

STANTON COUNTY.

(7.) Cottonwood, box-elder, maple (soft), walnut (black), ash (white), willow (white), oak (white), oak (burr), butternut (or white walnut), hickory, maple (hard), catalpa, ash (green), oak (red), locust (honey).

THAYER COUNTY.

(1.) Ash (white), walnut (black), cottonwood, maple (soft), box-elder, elm (white), locust (honey), locust (black), willow (white), hackberry, poplar (Lombardy), oak (red), chestnut, pine (white), pine (Scotch), cedar (red), mulberry (Russian), catalpa, balsam fir, cedar (white), Osage orange, arbor-vitæ, basswood (or linden), balm of Gilead, spruce (Norway).

VALLEY COUNTY.

(4.) Box-elder, cottonwood, ash (white), willow (white), catalpa, maple (soft), walnut (black), locust (honey), poplar (Lombardy), butternut (or white walnut), elm (white), hackberry, mulberry (Russian).

WASHINGTON COUNTY.

(6.) Cottonwood, walnut (black), box-elder, ash (white), maple (soft), locust (honey), locust (black), elm (white), basswood (or linden), Kentucky coffee, willow (white), catalpa, mulberry (Russian), maple (hard), elm (red), hackberry, butternut (or white walnut), hickory, oak (burr), oak (white), oak (red), chestnut, poplar (Lombardy), mulberry (native), ash (green), Osage orange, beech, birch, willow (red), spruce (Norway), pine (Scotch), pine (white), arbor-vitæ, cedar (red), horse-chestnut (or buckeye), cherry.

WAYNE COUNTY.

(4.) Cottonwood, box-elder, ash (white), walnut (black), maple (soft), ash (green), elm (red), catalpa, willow (white), mulberry (Russian).

WEBSTER COUNTY.

(7.) Cottonwood, box-elder, walnut (black), maple (soft), locust (honey), catalpa, elm (white), willow (white), mulberry (Russian), locust (black), ash (green), oak (white), maple (hard), butternut (or white walnut), poplar (Lombardy), ailanthus, elm (red), oak (burr), hackberry, hickory.

WHEELER COUNTY.

(4.) Cottonwood, walnut (black), ash (white), box-elder, catalpa, maple (soft), willow (white), elm (white), poplar (Lombardy), locust (honey), cedar (red).

YORK COUNTY.

(6.) Cottonwood, ash (white), box-elder, maple (soft), walnut (black), catalpa, locust (honey), willow (white), elm (white), mulberry (Russian), cedar (red), pine (Austrian), pine (Scotch), pine (white), spruce (Norway), ash (green), poplar (Lombardy), oak (burr), hickory, chestnut, butternut (or white walnut), Kentucky coffee, arbor-vitæ, oak (red), oak (white), persimmon, willow (weeping).

SUMMARY.

Fifty kinds of trees are reported from the State at large. In order of preference, the leading varieties are as follows:

Cottonwood, box-elder, ash (white), walnut (black), maple (soft), elm (white), willow (white), catalpa, locust (honey), elm (red), hackberry, locust (black), mulberry (Russian), maple (hard), cedar (red), oak (white), poplar (Lombardy), ash (green or black), oak (burr), hickory, Kentucky coffee, Osage orange, butternut (or white walnut), oak (red), pine (white), pine (Scotch), pine (Austrian), basswood (or linden), willow (red), cherry, spruce (Norway).

II.—THE KINDS TRIED WHICH PROVED UNSUCCESSFUL.

ADAMS COUNTY.

(1.) Box-elder has proved unsuccessful on account of attacks of grubs or borers in the base of the trunk, and by ravages of a large green worm that eats the foliage.

BOONE COUNTY.

(1.) Evergreens of all kinds fail, supposed to be on account of the hot, dry summers.

BUFFALO COUNTY.

(4.) Chestnut, hickory, butternut (or white walnut), maples (soft and hard), and beech die in July and August from the effects of hot sun. Hard freezes in winter cause many to die. Ailanthus is killed by winter.

BURT COUNTY.

(5.) Locust (black) is killed by borers. Chestnut (sweet) and horse-chestnut (or buckeye) winter-kills. Birch, the larches, pines, spruce (Norway), and balsam fir all die the second year from the effects of hot, dry weather during the summer; likewise butternut (or white walnut) and beech, but no cause is assigned therefor.

BUTLER COUNTY.

(5.) Poplar (Lombardy) is short-lived, and also subject to winter-kill. Catalpa, larch (European), maple (hard), and Osage orange all die from hard freezes in winter. Chestnut and locust (black) are killed by borers.

CASS COUNTY.

(2.) Spruce (American) and arbor-vitæ (golden) are killed by winter, and locust (black) is destroyed by borers.

CEDAR COUNTY.

(1.) Locusts (black) are killed by borers, and balm of Gilead is very much injured by grasshoppers.

CLAY COUNTY.

(3.) Evergreens of all kinds die from climatic causes, principally hot, dry summers. Poplar (Lombardy), willows, balm of Gilead, Osage orange, ailanthus, maple (soft), and walnut (black) cannot stand the hard freezes in winter.

COLFAX COUNTY.

(3.) Ash (mountain), spruce (Norway), larch (European), poplar (Lombardy), all die in winter. Locusts (black and yellow) are killed by borers. Chestnuts die from cold freezes in February. Maple (hard) is not suited to the climate. Box-elder and maple (soft) will not grow on high, dry land; they require low, moist places.

CUMING COUNTY.

(1.) Ailanthus winter-kills. Spruce (Norway) will not grow; it is supposed the weather is too hot and dry in summer. Locust (black) is killed by borers.

DAWSON COUNTY.

(3.) The oaks, hickories and the evergreens die in hot, dry summers. The willows, horse-chestnut (or buckeye), persimmon, sycamore and chestnut cannot stand hard freezes in winter, and ash (white) is killed by borers.

DOUGLAS COUNTY.

(2.) Beech, birch, hemlock and larch (European) die from climatic causes. Ash (white) and locust (black) are killed by borers and hard freezes.

FILLMORE COUNTY.

(1.) The maples, butternut (or white walnut), beech, chestnut, hickory and poplar (Lombardy) die from dry weather and cold winters.

FRANKLIN COUNTY.

(5.) Cottonwood, maple (soft), Osage orange, ailanthus and catalpa die from the hard, cold winters. The oaks, hickories, chestnut, box-elder and maple (hard) perish from dry soil and droughts.

FURNAS COUNTY.

(7.) Cottonwood, catalpa, willow (white), and the oaks are failures, from some unknown cause. The elms and maple (soft) are subject to attacks by small bugs; these, with the hot sun and dry winds, cause many to die. Spruce (Norway), hickories, and butternut (or white walnut) die in summer; the hot weather and drought are too much for them. Ash (white) and box-elder, die frequently. Maple (hard), red bud, red haw, larch (European), paw-paw and horse-chestnut (or buckeye) are not suited to climate and soil; they have a long tap-root, and the dry soil and climate cause them to die.

GREELEY COUNTY.

(1.) The maples are winter-killed; they cannot stand hard freezes.

HALL COUNTY.

(7.) Cottonwoods die from the effects of borers. Maples (soft) cannot stand the droughts on upland, but they succeed on low, moist land. Beech, catalpa, poplar (Lombardy), ailanthus, the pines, larch (European), and chestnut die from hard freezes, and locust (black) is killed by borers.

HAMILTON COUNTY.

(2.) The pines and all the evergreens, basswood (or linden), and hickory fail on account of dry weather in fall and winter.

HITCHCOCK COUNTY.

(1.) The pines die in hot summers and dry autumns. They are not suited to climate and soil.

JEFFERSON COUNTY.

(3.) Ailanthus is killed by winter. Chestnuts, the maples, cucumber, arbor-vitæ, the larches, poplar (Lombardy), beech, birch, butternut (or white walnut), and cherry die from climatic causes; the weather is too hot and dry in summer and too dry and cold in winter. Locust (black) is killed by borers.

JOHNSON COUNTY.

(4.) Poplar (Lombardy) is short-lived and winter-killed. Willow (weeping) winter kills. Cottonwood and locust (black) are destroyed by borers cutting the wood under the bark, causing them to perish in winter. Hickory and maple (hard) die from hot sun and winds in summer.

LANCASTER COUNTY.

(2.) Poplar (Lombardy) winter kills, and is generally short-lived. Maple (soft), the oaks, chestnut, and the pines fail by reason of climatic causes.

MADISON COUNTY.

(2.) Maples (soft) are killed by hard freezes in winter.

NEMAHA COUNTY.

(5.) Ailanthus is killed by hot sun and dry winds in the summer; sometimes the borers attack them. Larch (European), the pines, hemlock, balsam fir, and ash (mountain) are not suited to climate. Locusts (black and yellow) are killed by borers and hard freezes, and chestnut, the oaks and maple (hard) fail on account of extremes of winter and summer weather.

OTOE COUNTY.

(1.) Locust (black) is universally attacked by grubs or borers, which kill it.

PAWNEE COUNTY.

(1.) The subsoil is too light for chestnuts, and they do not succeed. Poplar (Lombardy) and persimmon are winter-killed.

PHELPS COUNTY.

(2.) Cottonwoods fail if planted on high, dry land; they cannot stand the hot, dry weather in July and August. Evergreens of all kinds fail; they die during the summer months. Maple (soft) winter-kills.

PLATTE COUNTY.

(4). Maples (hard and soft), chestnut, Osage orange and horse-chestnut (or buckeye) die during hard winters. The pines and hickories perish in summer, and locust (black) is killed by borers.

POLK COUNTY.

(4.) Maple (soft) and Osage orange are winter-killed. Locust (black) suffers from borers. Larch (European) and the hickories are killed by hot sun, and the oaks are destroyed by jack rabbits.

RED WILLOW COUNTY.

(7.) Ash (white), box-elder, cottonwood and maple (soft) do not succeed on dry soil; they require moisture. Hickory and beech are affected by the hot sun, and large numbers die. The oaks and cedar (red) suffer from excessive heat and cold.

SARPY COUNTY.

(6.) Locust (black) and ash (white) are killed by borers. Winter kills butternut (or white walnut), sassafras and aspen. Maple (hard), beech, larch (European), hickory and chestnut are destroyed by extremes of heat and cold.

SAUNDERS COUNTY.

(3.) Poplar (Lombardy) winter-kills; ash (mountain), cedar (red), and the pines, are not suited to the climate. The weather is too hot and dry in summer and too cold in winter.

SEWARD COUNTY.

(8.) Butternut (or white walnut) suffers from climatic causes; chestnut and beech winter-kill; larch (European) and hickory are destroyed by dry, hot weather; locust (black) and poplar (Lombardy) die from attacks of borers and hard, cold winters, and cottonwoods die in a few years from borers.

STANTON COUNTY.

(1.) The evergreens of all kinds cannot stand the droughts, and consequently fail.

THAYER COUNTY.

(1.) Willows (yellow and weeping), poplars (Lombardy), spruce (Norway), and arbor-vitæ are all subject to winter-kill; they cannot stand hard freezes.

WASHINGTON COUNTY.

(3.) Maple (hard), chestnut, butternut (or white walnut), sycamore, the evergreens, poplar (Lombardy), horse-chestnut (or buckeye), the oaks and hackberry, die from heat and drought in summer, and hard freezes in winter; locust (black) is killed by borers.

WAYNE COUNTY.

(1.) Ailanthus dies in extreme cold weather, and evergreens of all kinds fail in summer; they are not suited to the climate.

WEBSTER COUNTY.

(3.) Cottonwoods are often attacked by borers and die in a few years; maples (hard and soft) cannot stand the hot weather in summer and cold in winter.

WHEELER COUNTY.

(1.) Catalpa dies in winter: the climate is too cold.

YORK COUNTY.

(4.) Catalpa, ailanthus and maple (soft), are winter-killed. Elms (white and red), hackberry, sycamore, poplar (Lombardy), horse-chestnut (or buckeye), and maple (hard), are failures on high table-land; they require moisture. Ash (mountain) is killed by borers; larch (European), the pines and all evergreens, die during the second summer, not being suited to the climate.

SUMMARY.

Forty-two kinds of trees are mentioned as having been tried, which did not prove successful. The following is the list and the number of times each is stated in the reports: Locust (black), 18; maple (soft), 18; chestnut, 17; maple (hard), 16; hickory, 14; poplar (Lombardy), 14; larch (European), 12; ailanthus, 9; evergreens, 9; oaks, 9; pines, 9; butternut (or white walnut), 8; cottonwoods, 8; catalpa, 6; horse-chestnut (or buckeye), 6; Osage orange, 6; spruce (Norway), 6; box-elder, 5; ash (mountain), 4; ash (white), 4; arbor-vitæ, 3; birch, 3; sycamore, 3; willow (white), 3; balm of Gilead, 2; balsam fir, 2; cedar (red), 2; elms (white and red), 2; hackberry, 2; hemlock, 2; locust (yellow), 2; persimmon, 2; willow (weeping), 2; and aspen, cherry, cucumber, haw (red), basswood (or linden), paw-paw, redbud, sassafras, walnut (black), and willow (yellow), each once.

III.—THE INJURIES NOTICED TO HAVE OCCURRED FROM INSECTS OR OTHER CAUSES.

ADAMS COUNTY.

(1.) Worms eat the foliage of ash (white), box-elder, and cottonwood.

ANTELOPE COUNTY.

(1.) Caterpillars and grasshoppers sometimes injure cottonwoods. (2.) A bug resembling the potato bug, but about half the size, is doing some injury to the cottonwoods by eating the foliage.

BUFFALO COUNTY.

(1.) A small beetle bores into the twigs of the ash (white), causing much injury. (2.) Rabbits do great injury by girdling young trees in winter, and prairie fires are very destructive.

BURT COUNTY.

(1.) The borers are very destructive to locusts (black).

BUTLER COUNTY.

(1.) The ravages of the caterpillars are very injurious. (2.) Borers injure cottonwood and ash (white), and worms attack willow (white). (3.) The south winds seem to do more injury than anything else. (4.) Grasshoppers are destructive to a limited extent. (5.) Grasshoppers, bugs, and caterpillars eat the leaves. (6.) Borers and caterpillars injure the cottonwoods. (7.) Borers seriously affect the maples.

CASS COUNTY.

(1.) The borers injure cottonwood. (2.) Rabbits, gophers, mice and borers do great damage to young trees, and stock running at large is sometimes very injurious. (3.) A species of beetle has caused great damage to maples (soft) and box-elder. (4.) Borers or grubs are destructive to locusts (black), maples (soft), and other trees.

CEDAR COUNTY.

(1.) Gophers seriously injure maples (soft) by eating the roots.

CLAY COUNTY.

(1.) Caterpillars and worms eat the foliage from cottonwoods and box-elders. (2.) Borers injure some trees. (3.) Grasshoppers, hail and drought have done some injury.

COLFAX COUNTY.

(1.) The borers and "tent" caterpillars injure ash (mountain) and cottonwood. (2.) The white beetle stings the cottonwoods in June, which causes borers in large numbers to cut the trees into a honeycomb from the roots to the top. All efforts to get rid of them, thus far, have failed. (3.) Worms generally follow a severe drought and do serious damage.

CUMING COUNTY.

(1.) Grasshoppers do damage by eating the bark and leaves. (2.) Gophers eat the roots of the Osage orange, causing large numbers to die. (3.) Gophers and caterpillars are injurious to trees.

CUSTER COUNTY.

(1.) Borers attack the ash (white), and kill many. (2.) Borers injure cottonwoods. (3.) Hail is very injurious. (4.) Grasshoppers are the only cause of injury.

DAWSON COUNTY.

(1.) Grasshoppers and dry weather are damaging. (2.) The borer, curculio and a large green worm all do great injury to trees. (3.) The cut-worms are destructive to ash (white) when planted in the fall.

DODGE COUNTY.

(1.) The borers do the greatest amount of damage to trees in this section.

DOUGLAS COUNTY.

(1.) Grubs or borers injure the cottonwoods when planted too thick. (2.) Rabbits do considerable damage. (3.) Borers kill the locusts (black).

FILLMORE COUNTY.

(1.) The hot sun in summer burns the bark at the ground, on the south side of the trees, so that it cracks and falls off, doing material injury. (2.) The borers kill maples (soft) and box-elders.

FRANKLIN COUNTY.

(1.) The borers injure cottonwoods and maples (soft). (2.) Moths injure cottonwoods. (3.) Dry, hot winds kill more trees than all things else. (4.) Worms on cottonwoods do some injury.

FURNAS COUNTY.

(1.) Grasshoppers, bugs and worms have done much damage. (2.) Rocky Mountain locusts frequently injure trees. (3.) Rabbits are very destructive. (4.) Yellow beetles are injurious to oaks, and rabbits damage all kinds but ash (white).

GREELEY COUNTY.

(1.) The borers do more injury to trees than all other causes combined.

HALL COUNTY.

(1.) The borers are very destructive to locusts (black). (2.) Grasshoppers, caterpillars, and borers are very damaging. (3.) Grubs in the roots of trees kill many. (4.) Borers and rabbits are injurious. (5.) Hail storms are damaging.

HAMILTON COUNTY.

(1.) The borers, the tobacco worms and sun-blight are all damaging to a greater or lesser degree. The principal attacks are made upon the cottonwoods, ash (white), maple (soft), walnut (black), and box-elder.

HITCHCOCK COUNTY.

(1.) Grasshoppers are injurious. (2.) The borers injure locusts (yellow), and maple (soft), and cottonwoods suffer to some extent from drought.

JEFFERSON COUNTY.

(1.) The borers are very destructive to trees.

JOHNSON COUNTY.

(1.) Worms eat the leaves of maples (soft), and while they do not die, still they are injured by the growth being retarded. (2.) Borers and caterpillars are injurious. (3.) The borers kill the locusts (black) very badly. (4.) Worms resembling the army worm attack the maples (soft), and Rocky Mountain locusts do great damage.

LANCASTER COUNTY.

(1.) The borers injure walnut (black), locust (black), and ash (white). A small green worm injures catalpa by cutting the terminal bud. (2.) The borers are very injurious to maples (soft), ash (white), and cottonwoods. (3.) The borers, green worms and caterpillars are doing considerable injury.

LINCOLN COUNTY.

(1.) Flat-head borers are doing great injury; they cut the wood under the bark, which causes the trees to die.

MADISON COUNTY.

(1.) A small bug, similar to the potato bug, injures trees by eating the leaves. (2.) Grasshoppers and drought do some damage.

BURT COUNTY.

(1.) The borers are very destructive to locusts (black).

BUTLER COUNTY.

(1.) The ravages of the caterpillars are very injurious. (2.) Borers injure cottonwood and ash (white), and worms attack willow (white). (3.) The south winds seem to do more injury than anything else. (4.) Grasshoppers are destructive to a limited extent. (5.) Grasshoppers, bugs, and caterpillars eat the leaves. (6.) Borers and caterpillars injure the cottonwoods. (7.) Borers seriously affect the maples.

CASS COUNTY.

(1.) The borers injure cottonwood. (2.) Rabbits, gophers, mice and borers do great damage to young trees, and stock running at large is sometimes very injurious. (3.) A species of beetle has caused great damage to maples (soft) and box-elder. (4.) Borers or grubs are destructive to locusts (black), maples (soft), and other trees.

CEDAR COUNTY.

(1.) Gophers seriously injure maples (soft) by eating the roots.

CLAY COUNTY.

(1.) Caterpillars and worms eat the foliage from cottonwoods and box-elders. (2.) Borers injure some trees. (3.) Grasshoppers, hail and drought have done some injury.

COLFAX COUNTY.

(1.) The borers and "tent" caterpillars injure ash (mountain) and cottonwood. (2.) The white beetle stings the cottonwoods in June, which causes borers in large numbers to cut the trees into a honeycomb from the roots to the top. All efforts to get rid of them, thus far, have failed. (3.) Worms generally follow a severe drought and do serious damage.

CUMING COUNTY.

(1.) Grasshoppers do damage by eating the bark and leaves. (2.) Gophers eat the roots of the Osage orange, causing large numbers to die. (3.) Gophers and caterpillars are injurious to trees.

CUSTER COUNTY.

(1.) Borers attack the ash (white), and kill many. (2.) Borers injure cottonwoods. (3.) Hail is very injurious. (4.) Grasshoppers are the only cause of injury.

DAWSON COUNTY.

(1.) Grasshoppers and dry weather are damaging. (2.) The borer, curculio and a large green worm all do great injury to trees. (3.) The cut worms are destructive to ash (white) when planted in the fall.

DODGE COUNTY.

(1.) The borers do the greatest amount of damage to trees in this section.

DOUGLAS COUNTY.

(1.) Grubs or borers injure the cottonwoods when planted too thick. (2.) Rabbits do considerable damage. (3.) Borers kill the locusts (black).

FILLMORE COUNTY.

(1.) The hot sun in summer burns the bark at the ground, on the south side of the trees, so that it cracks and falls off, doing material injury. (2.) The borers kill maples (soft) and box-elders.

FRANKLIN COUNTY.

(1.) The borers injure cottonwoods and maples (soft). (2.) Moths injure cottonwoods. (3.) Dry, hot winds kill more trees than all things else. (4.) Worms on cottonwoods do some injury.

FURNAS COUNTY.

(1.) Grasshoppers, bugs and worms have done much damage. (2.) Rocky Mountain locusts frequently injure trees. (3.) Rabbits are very destructive. (4.) Yellow beetles are injurious to oaks, and rabbits damage all kinds but ash (white).

GREELEY COUNTY.

(1.) The borers do more injury to trees than all other causes combined.

HALL COUNTY.

(1.) The borers are very destructive to locusts (black). (2.) Grasshoppers, caterpillars, and borers are very damaging. (3.) Grubs in the roots of trees kill many. (4.) Borers and rabbits are injurious. (5.) Hail storms are damaging.

HAMILTON COUNTY.

(1.) The borers, the tobacco worms and sun-blight are all damaging to a greater or lesser degree. The principal attacks are made upon the cottonwoods, ash (white), maple (soft), walnut (black), and box-elder.

HITCHCOCK COUNTY.

(1.) Grasshoppers are injurious. (2.) The borers injure locusts (yellow), and maple (soft), and cottonwoods suffer to some extent from drought.

JEFFERSON COUNTY.

(1.) The borers are very destructive to trees.

JOHNSON COUNTY.

(1.) Worms eat the leaves of maples (soft), and while they do not die, still they are injured by the growth being retarded. (2.) Borers and caterpillars are injurious. (3.) The borers kill the locusts (black) very badly. (4.) Worms resembling the army worm attack the maples (soft), and Rocky Mountain locusts do great damage.

LANCASTER COUNTY.

(1.) The borers injure walnut (black), locust (black), and ash (white). A small green worm injures catalpa by cutting the terminal bud. (2.) The borers are very injurious to maples (soft), ash (white), and cottonwoods. (3.) The borers, green worms and caterpillars are doing considerable injury.

LINCOLN COUNTY.

(1.) Flat-head borers are doing great injury; they cut the wood under the bark, which causes the trees to die.

MADISON COUNTY.

(1.) A small bug, similar to the potato bug, injures trees by eating the leaves. (2.) Grasshoppers and drought do some damage.

MERRICK COUNTY.

(1.) A striped bug or beetle has been very destructive to cottonwoods, poplar (Lombardy), and willow (white). (2.) Worms affect box-elders. (3.) Grasshoppers, borers and sun-scald are injurious. (4.) Borers and grasshoppers do much damage, especially to cottonwoods. (5.) Borers, locusts, bugs and grasshoppers seriously damage trees.

NANCE COUNTY.

(1.) Borers and south winds do great injury to forest trees. The effect of the south wind is to dry out the sap and make the bark crack and split and roll up, leaving the wood exposed; the borers then go to work.

NEMAHA COUNTY.

(1.) The borers kill large numbers of locusts (black) and cottonwoods. (2.) Borers attack maple (soft) and ailanthus when they are trimmed up so that the sun strikes the trunk, causing large numbers to die. (3.) The borers almost entirely destroy locusts (black and yellow). In some seasons worms eat the leaves from maple (soft). (4.) Chinch bugs injure young plants very much, and green worms infest the maples (soft).

PAWNEE COUNTY.

(1.) Caterpillars are sometimes very injurious, especially to maples (soft).

PHELPS COUNTY.

(1.) Mountain locusts sometimes destroy cottonwoods. (2.) Rabbits cause the greatest injury.

PLATTE COUNTY.

(1.) Grasshoppers are injurious. (2.) Borers damage cottonwoods and box-elders. (3.) Prairie fires are very destructive. (4.) Borers attack cottonwood and locust (black). (5.) Borers and caterpillars are injurious.

POLK COUNTY.

(1.) A large green worm injures box-elders, and grubs or borers attack the ash (white). (2.) Borers, locusts and grasshoppers are destructive.

RED WILLOW COUNTY.

(1.) Beetles and worms are injurious. (2.) Grasshoppers and beetles affect trees. (3.) Rabbits do great injury. (4.) Grasshoppers, gophers and grub worms are damaging.

SALINE COUNTY.

(1.) Grasshoppers are troublesome; flat-head borers kill the maples and ash (mountain), and a large caterpillar, five inches long, injures box-elder. (2.) Borers injure box-elders and maples (soft).

SARPY COUNTY.

(1.) The borers kill locusts (black) and cottonwoods, and caterpillars attack walnut (black.) (2.) The borers seriously injure the hickories and locusts (black.) (3.) Worms are troublesome and storms are sometimes very injurious.

SAUNDERS COUNTY.

(1.) Worms or caterpillars are damaging. (2.) Roaming cattle injure trees badly. (3.) Borers and worms are injurious. (4.) Borers kill locusts (black).

SEWARD COUNTY.

(1.) Grasshoppers injure all kinds of trees. (2.) Borers do the most injury. (3.) Caterpillars injure walnut (black) and box-elders. (4.) Cattle running at large injure young forest trees. (5.) Sun-scald causes many trees to die. (6.) Borers injure the cottonwoods, and heavy sleets in winter cause the trees to break badly. (7.) The white wire-worm is injurious. (8.) Borers attack cottonwoods and maples (soft).

STANTON COUNTY.

(1.) The borers and prairie fires are very destructive to forest trees.

THAYER COUNTY.

(1.) The borers are very injurious, and green worms and caterpillars do some damage. (2.) The grasshoppers injure all kinds of trees. (3.) Borers, worms and hail-storms are all destructive to trees.

VALLEY COUNTY.

(1.) The borers cut into the cottonwoods, causing them to die.

WASHINGTON COUNTY.

(1.) Borers attack cottonwoods, locusts (black), maples and willow. (2.) Wind storms are very damaging to trees.

WAYNE COUNTY.

(1.) Caterpillars devour the leaves of trees, and while they do not die, still their growth is retarded.

WEBSTER COUNTY.

(1.) Worms and beetles are injurious to young trees. (2.) The borers kill many trees. (3.) The cottonwood worms are sometimes injurious. (4.) Caterpillars are the most troublesome of all insects.

WHEELER COUNTY.

(1.) The borers kill many cottonwoods, and caterpillars are also troublesome. (2.) Excessive wet weather injures young trees.

YORK COUNTY.

(1.) The borers injure the ash (white); cottonwoods are affected by a small fly and sun-scald, and caterpillars of large size injure box-elders. (2.) Large spotted worms, mostly green, injure box-elders, and a small, black worm attacks the locusts. (3.) Excessive wet weather in the spring, then turning off dry, causes the trees to scald; the skin seems to blister, and many die.

IV.—OTHER DIFFICULTIES OBSERVED IN ATTEMPTS AT TREE-PLANTING.

ADAMS COUNTY.

(1.) The winters are sometimes too severe and dry, when there is no rainfall from September until June following; but the main difficulty is, the trees are not properly cared for after planting. (2.) Late planting in spring and planting in new soil before the land is subjugated are serious obstacles to success.

ANTELOPE COUNTY.

(1.) Negligence and prairie fires are difficulties.

BOONE COUNTY.

(1.) The greatest difficulty attending tree-planting is the custom of setting out young trees in the spring, when, if a long drought should occur, the trees die before they can take root, for want of moisture. (2.) Dry weather in autumn, winter and spring are serious obstacles.

BUFFALO COUNTY.

(1.) Planting trees in new land before it is subdued occasions trouble. The tree-claim act does not give sufficient time to get the land thoroughly prepared before planting. (2.) The dry seasons retard tree-culture.

BUTLER COUNTY.

(1.) Planting in new land before the wild grass is subjugated.

CASS COUNTY.

(1.) Late planting of trees and carelessness in packing young trees to be shipped. When they arrive at their destination they are in bad order, and consequently many die. (2.) Fall planting is sure to fail, on account of the dry winter. (3.) Dry, hot winds.

CLAY COUNTY.

(1.) Carelessness and lack of experience in handling and planting; want of mulching and pruning, and excessive dry weather at planting time. (2.) Want of time to subdue the land properly. (3.) Prairie fires. (4.) Want of attention and proper cultivation.

COLFAX COUNTY.

(1.) Planting trees too far apart, which gives the hot southwest winds too much sway, causing great destruction.

CUMING COUNTY.

(1.) Dry weather is one great difficulty. (2.) Ignorance in tree-planting and want of proper preparation of soil before the trees are set.

CUSTER COUNTY.

(1.) Difficulty in obtaining trees. (2.) Want of proper preparation of land and due attention in setting the trees. (3.) Drought is a serious difficulty. (4.) Failure to plant at proper time; the fall is the best time, as the earth becomes packed around the roots and retains moisture better and longer than spring planting. (5.) Drought and hot winds. (6.) Lack of experience in tree-culture.

DAWSON COUNTY.

(1.) Planting out trees too early and too late. In the former the weeds get the advantage of the trees, and in the latter dry weather sets in before the trees start. (2.) Want of proper cultivation. (3.) Hail-storms are very damaging. (4.) Also extremes of winter and summer weather.

DODGE COUNTY.

(1.) Want of attention and lack of proper cultivation after planting.

DOUGLAS COUNTY.

(1.) Gathering seeds in fall and keeping them over until spring, which causes them to become so dry they fail to germinate. (2.) Extreme hot weather.

FILLMORE COUNTY.

(1.) Planting in dry weather without mulching. (2.) Pruning young trees too profusely, which exposes the trunks to the hot sun and creates sun-scald. (3.) Failure to plant early enough in spring.

FRANKLIN COUNTY.

(1.) Planting on land before it is subdued. (2.) Drought is a great difficulty. (3.) Excessive dry weather, and in some sections too much alkali in the soil. (4.) Drought, careless planting and want of cultivation.

FURNAS COUNTY.

(1.) Drought and hot winds. (2.) Planting too early. (3.) The injury from drought and hot winds could be obviated in a great measure by mulching.

HALL COUNTY.

(1.) Want of care and attention for the first three or four years after planting. (2.) Drought in summer. (3.) Injudicious selection of soil, careless planting, and general mismanagement in cultivation; also prairie fires.

HAMILTON COUNTY.

(1.) Drying out trees before transplanting; careless planting and want of proper cultivation. (2.) Drought is the principal difficulty.

JEFFERSON COUNTY.

(1.) Want of time to prepare the land properly, and lack of means.

JOHNSON COUNTY.

(1.) Want of care in planting, and lack of proper attention and cultivation. (2.) Dry weather in July and August.

LANCASTER COUNTY.

(1.) Trouble in getting proper seeds. (2.) Planting on new land before it is properly subdued. (3.) Want of proper cultivation, and in some instances planting trees too thickly.

MADISON COUNTY.

(1.) Occasional dry springs. (2.) Sometimes the roots become dry and lose their vitality before planting.

MERRICK COUNTY.

(1.) A hard-pan under the soil prevents young trees from growing. (2.) Want of knowledge in preparing the soil, and in planting and cultivation; drought some years is a serious difficulty.

NEMAHA COUNTY.

(1.) Trees do not succeed well on a south or southwest slope. (2.) Long dry spells. (3.) Planting trees too thickly.

PAWNEE COUNTY.

(1.) Carelessness and want of attention in cultivation. (2.) Want of proper knowledge of tree planting and culture; excessive drought some years. (3.) Difficulty in germinating seeds, and drought in early spring.

PHELPS COUNTY.

(1.) The limit of the tree-culture act is so short that the farmers do not have time to subdue the land properly before planting. (2.) Drought is one great difficulty. (3.) Too much dry weather in the fall.

PLATTE COUNTY.

(1.) Carelessness in preparing the land and in planting trees. (2.) Trouble in procuring trees in good condition from the nurseries. (3.) Hot winds in summer and frosts in winter. (4.) Early and late frosts and prairie fire.

POLK COUNTY.

(1.) Want of knowledge in planting, and lack of judgment in preparing the land for cultivation of trees. General carelessness.

RED WILLOW COUNTY.

(1.) Hot winds in summer. (2.) Want of rain. (3.) Planting before the land is subdued. (4.) The dryness of the climate. (5.) Planting trees too thickly.

SALINE COUNTY.

(1.) Dry winds; ignorance in preparing the land, planting trees improperly, and carelessness in cultivation. (2.) Droughts occurring periodically.

SARPY COUNTY.

(1.) Planting trees too thickly. The law requires four feet each way; they should be ten. (2.) Planting on new land before it is subdued. (3.) Want of proper culture. (4.) Dry weather in spring. (5.) Want of proper attention after planting; in many instances they are left to themselves to live or die, and they generally die. Cattle also injure trees very much.

SAUNDERS COUNTY.

(1.) Dry, hot weather in June. (2.) The dry climate is the most serious difficulty to overcome. (3.) Winds and fires.

SEWARD COUNTY.

(1.) Planting trees in new land before it is in proper condition. (2.) The hot sun and hot south winds cause the trees to sun-scald, and large numbers die. (3.) Dry weather in midsummer. (4.) In very dry seasons young trees die early in autumn. (5.) Drought at time of planting.

STANTON COUNTY.

(1.) Dry weather is the only difficulty.

THAYER COUNTY.

(1.) Stock running at large and prairie fires.

VALLEY COUNTY.

(1.) Planting trees before the land is in proper condition. (2.) Laziness and want of experience.

WASHINGTON COUNTY.

(1.) Want of knowledge in tree culture. (2.) Negligence and prairie fires. (3.) Want of interest in the cultivation of trees.

WEBSTER COUNTY.

(1.) Want of proper culture. (2.) Dry weather in spring, and hot winds in July and August. (3.) The dry atmosphere and want of moisture. (4.) Want of preparation of land, planting out of season and lack of proper culture.

WHEELER COUNTY.

(1.) Planting before the land is in proper condition. (2.) Want of interest (3.) Hot sun. Absence of energy on the part of farmers.

YORK COUNTY.

(1.) Failure to prepare the land properly before planting. (2.) Negligence and carelessness in planting.

CONCLUSIONS.

The following conclusions are drawn from the reports from the prairie States relating to the collection and preservation of seeds or young plants, the time of planting and management, the preparation of the soil, the intervals between the trees and the kinds which promise to be most profitable:

Nature seems to have pointed out most definitely the proper time for gathering all kinds of seeds. When thoroughly ripe, the parent tree casts forth the seeds to the ground. Some ripen in the latter part of spring, some in summer and others in autumn or fall. Hence it is safe to conclude that the most auspicious time to collect seeds is when they ripen and fall to the ground and before they become too dry.

Nature also appears to teach with great clearness and force that the best time to plant is when the seeds are fully ripe; for, when the parent tree casts forth the ripe seeds, nature is simply planting, as leaves and mold gradually gather over them, and in due time they sprout and become infant trees. It is also worthy of notice that nature does not plant seeds deeply in the soil, but rather with a slight covering, clearly teaching that deep planting is not necessary and may prove harmful.

The land should be well broken and thoroughly pulverized. Then lay off in rows 4 feet apart, drop the nuts or seeds 18 inches or 2 feet apart in the rows, and cover walnuts and hickory-nuts 3 to 4 inches deep, and acorns and others about 2 inches. When they spring up, cultivate the same as corn, so as to keep down the grass.

Walnuts, and all other kinds having a long tap-root, should be planted where they are to grow, as they are liable to be injured and their growth retarded when transplanted. When they begin to crowd each other, thin them out a little, not too much or the tops will spread. If it be desirable to have them grow with long, straight trunks, this can only be attained by thick planting. As they advance, the thinning process should be repeated from time to time, until the trees stand about 16 feet apart each way. Cultivate well for a few years, or until the trees shade the land sufficiently to keep down the grass and weeds.

The kinds which do not have a tap-root should be cultivated in the nursery for two years, when they should be taken up and transplanted in the groves where they are to remain.

The land for the groves should be well prepared, as before stated, and laid off in rows four feet each way. Dig large holes so as to admit all of the roots without crowding. The tops should always be adapted

to the size and power of the roots. As the trees grow up, thin out by cutting or taking up each alternate row until they stand 16 feet apart each way. Let the cultivation be kept up until the trees shade the ground.

If it be impracticable to plant the above-mentioned seeds or nuts in the fall or at the time of ripening, much care should be observed in keeping them through the winter for spring planting. They should be put in piles on top of the ground, where it is neither too dry nor too damp, and covered well with wood-mold, leaves, and soil or sand; then throw on some brush to prevent them from being disturbed. Keep them moderately damp. Freezing in winter does not hurt. Especial care must be taken to prevent ground-squirrels, rats and mice from destroying them during the winter. Seeds kept in this way should be planted in early spring before they begin to sprout, or the sprouts will break off and many be lost unless carefully handled.

The foregoing is applicable, principally, to the nut-bearing trees.

In order to insure success in growing trees, planted or transplanted in fall or spring, much depends upon having the land in good condition, proper care in taking up and transplanting, and upon thorough cultivation for three or four years, or until the ground is sufficiently shaded. But the cultivation should not be maintained too late in summer, because it forces the tree-growth too late in the fall. The wood thus made, not being well ripened, is more easily killed by frosts. The cultivation, therefore, should not continue later than the middle of July or 1st of August.

Cottonwood, willows, maples, balm of Gilead and poplar (Lombardy) may be propagated from cuttings. These should not be too large or too small, but about medium. It is better to cut and set them in the spring, care being taken not to let them dry. They may, however, be kept through the winter if put in a moist place, but should not be allowed to freeze.

The cuttings should not be set straight up, but leaned to an angle of about 45 degrees; then, as the ground settles, it packs to the cuttings and prevents them from becoming loose. They should always be set where they are to grow, as it is best not to disturb them. The preparation of the land and culture should be the same as for those transplanted from the nursery.

Much care should be taken in transplanting evergreens or coniferous trees, such as pines, spruces, larches, arbor vitæ, &c. The roots should not be exposed to the sun or wind. It is well to submerge them in a thin "loblolly" as soon as taken up, as it is extremely necessary that they be kept moist. With this precaution there will not be much trouble in having them live and thrive. It is better, however, to set them in alternate rows between other trees which have been planted two or three years, in order to protect them from the hot sun and the wind.

In setting trees for wind-breaks they should be in rows 6 feet apart and 18 inches in the row.

The kinds promising to be most profitable stand, in order and grade, walnut (black), 55; ash (white), 13; maple (soft), 12; catalpa, 8; willow, 5, and elm (red), 4.

REPORT ON THE CONDITION OF FORESTS, TIMBER-CULTURE, ETC., IN THE SOUTHERN AND WESTERN STATES.

By F. P. BAKER, *Agent of the Department.*

By an order from the Commissioner of Agriculture, dated May 1, 1883, the writer was designated to report upon the condition of forests, timber-culture, &c., in the following group of States and Territories: Kansas, Colorado, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Indian Territory, Texas, New Mexico and Arizona.

The States of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas and Texas, comprise the larger portion of the country styled in common parlance "the South."

Here is a great region, the forest resources of which cannot be given in detail or with anything approaching accuracy without personal examination or by an elaborate system of correspondence, both of which means of securing information, owing to circumstances which neither the Department nor its agent have been able to control, have not been attainable; yet no region, at this precise juncture of its history, needs more light and the application of the latest and most intelligent ideas. For while the North has lost (perhaps beyond repair) a great amount of its timber area, the South has still a vast amount of forest which may be husbanded and saved. So far, forestry may be said to be an unknown art in the South; societies of any sort, even for agricultural or horticultural advancement, are rare as compared with other sections of the Union; the magnificent agricultural and horticultural reports which even the newer Western States like Kansas publish, are not yet known in the Southern States, and information respecting their resources is chiefly obtainable from "immigration documents" issued since the war. Yet the South is the land of forests. The whole surface of these States, with the exception of Texas, was originally covered with forest growth, and from North Carolina to Louisiana nearly six-tenths of the area is still wooded. All estimates lack accuracy; but of the 500,000,000 acres south of the Ohio River, 400,000,000 we may say are still in timber.

This forest, vast in extent, is also wonderful in its variety. Nearly every tree that grows north of the Ohio is found south of it, and mingled with these trees are many varieties known only in the South. Judge Knapp stated in a paper read before the Forestry Congress at Saint Paul, Minn., that one-half of the varieties of trees growing in the United States were to be found in Florida, and no less than fifty varieties were confined to that State alone, while more ornamental woods existed there than in all the other States and Territories combined. Judge Knapp also gave a hint to the forestry of the future by saying, that tropical trees not now growing in Florida could be introduced there and made to grow with success.

Probably the most remarkable Southern State, because of its vast area and geographical position, is the State of Texas, and fortunately, owing

to the labors of Dr. Mohr, of Mobile and Mr. Munson, of Denison, the trees of Texas are better known than those of most other Southern States. Western Texas in its vegetation resembles Mexico, and here grows that singular shrub, the mesquit, or Texas gum-arabic tree, with its immense roots which form the fuel of a vast region, and which can be used green in the forge with almost equal effect as charcoal. In fact, the roots, dug and delivered, bring $6 to $10 per ton, and serve as good a purpose as so much coal. Texas, too, produces abundantly the pecan, which is found near all fresh water where timber grows throughout the State. The trees in the bottom lands of the Trinity, Brazos and Colorado, attain to 3 or 4 feet in diameter, and from 75 to 100 feet in height. The trees are considered so valuable that they are protected by special statute from the ax of the nut hunter. Dr. Mohr states that in the season of 1880, 1,250,000 pounds of pecans were received at San Antonio alone, the price varying from 5 to 6 cents a pound. The value of the pecans exported from Indianola is estimated at $2,000,000. A pecan orchard comes to maturity in six years and, while the natural eastern limit of the tree in the Southern States is the eastern bottoms of the Mississippi, trees are growing in South Carolina which were planted by the Huguenots, and Dr. Mohr has been successful in growing the tree near Mobile.

The live oak in Texas occupies an area of 300 by 500 miles, and on the Colorado it attains a height of from 75 to 100 feet and a diameter of 4 feet.

The bald or deciduous cypress is found in abundance in the swampy bottom lands of Eastern Texas, rearing aloft its huge, straight, branchless trunk from 75 to 100 feet, affording splendid material for posts, piles, shingles, water-tanks and a thousand other valuable uses.

The bois d'arc, or Osage orange, attains its greatest perfection in Texas, growing, in northern central Texas, 3 to 4 feet in diameter and 60 or 70 feet in height.

The Texas umbrella tree, vouched for by Mr. Munson, is a quick, perfect and handsome shade tree, forming a dense umbrella head without pruning; it grows well in Northern Texas and in the Indian Territory. It answers the same purpose as a quick shade tree, such as the cottonwood in more northern latitudes.

The most valuable tree of Texas and of all the Gulf States, is the long-leaved or yellow pine. It is to the extreme South what the white pine is to the extreme North. It grows in Texas in the counties of San Jacinto, Liberty, Polk, Hardin, Tyler, Jasper, Newton, Angelina, San Augustine, Sabine, Nacogdoches and Shelby. It forms part of the great forest region of Eastern Texas, a country larger than the State of Ohio, and extending into Louisiana and Arkansas. The few species of trees here mentioned are associated with nearly all the trees which grow in the central United States. They are mentioned as distinctively Southern, forming a great part of the immense forest belt which stretches from the Trinity and Brazos to the Atlantic.

Louisiana, believed by many to be a vast, partially reclaimed swamp, devoted to sugar and cotton, has really a great diversity of surface; the low country subject to overflow, prairies low and upland, and a hilly and forested region. In Western Louisiana, the yellow pine attains its perfection, the yield of lumber being 6,000 to 7,000 feet to the acre, allowing only one cut of 20 feet to each tree. The "pine flats," as they are called in Louisiana, cover nearly one-half of the parishes of Saint Tammany, Tangipahoa, Livingston, and Calcasieu. The charcoal-burners have a fine field in this region, shipping their product to New Orleans,

where they receive from 25 to 50 cents a barrel for it. The manufacture of tar, pitch and turpentine has been carried on in this region to a limited extent, and is increasing. The great parish of Calcasieu on the Gulf of Mexico, the largest in Louisiana, is a lumbering country, the principal business being the shipment of pine and cypress to Texas ports. Saint Mary's Parish, also on the Gulf, is a lumber region. At Morgan City the steamship wharves are made of cypress, obtained at a short distance and at small cost, from the neighboring woods and swamps. Millions of railroad ties, with sawed and dressed lumber, are shipped to Texas and used in the construction of railroads in that State. In this vicinity is the great live-oak region which, for years, supplied the navy-yards of the Atlantic coast.

In Mississippi, the yellow pine widens, extending farther to the northward than in Texas; and in Alabama there is a belt of pine also extending across the center of the State. Of this yellow-pine belt, Dr. Mohr says:

"Fronting the Gulf, with its fine harbors and safe roadsteads, crossed by navigable rivers, whose tributaries extend in all directions through its lower division, making the water, during the periods of the higher stages, available for transportation to the mills, and intersected by several railroad lines leading to the markets of the East and Northwest, this great timber region possesses advantages found rarely combined for the utilization of its great timber wealth and the development of the industries based on its capacities, which at present are carried on with great and constantly increasing activity."

In Florida the great pine forests are found in the western portion, in Santa Rosa, Washington, Walton, and Holmes counties; but the whole peninsula is a forest. The cedar swamps of Florida have for years supplied the pencil-manufactories of the world, and the live-oak forests of Florida have a world-wide reputation.

The State of Georgia, which stands pre-eminent among the Southern States in the matter of commercial importance and wealth, is also a timber producing State of the first rank. Fully half the State is covered with long-leaved pine, and the region cut over is confined to the borders of streams, comprising but a small fraction of the great body. Although the northern half of Georgia is called a hardwood country, there is much short-leaved pine mixed with the deciduous growth, especially in the extreme northern counties.

Arkansas has a large body of long-leaved pine, which is part of the great belt described as beginning in Texas. This great forest has scarcely been touched, the denuded portion being narrow strips along the lines of the railroads. North of the Arkansas river the timber is principally hardwood, but there are masses of yellow pine scattered about. In Arkansas there is also a great amount of cypress. Arkansas contains the largest body of yellow pine in close proximity to the great prairie region west of the Missouri, and therefore, the preservation of the forests of this State, is a matter of peculiar interest.

Here we have roughly sketched a great forested region which may be called distinctively southern, the trees being the yellow-pine, the live-oak and the cypress. To the northward of this and bordering upon it follows along a great belt of the short-leaved pine, sometimes covering the ground, but frequently mixed with deciduous trees, the latter becoming more frequent as you journey northward from the Gulf and northwest from the Atlantic, until the pine nearly disappears in the hardwood forests of Northern Alabama, Georgia and Tennessee, and this is the South, speaking in a general sense.

THE FUTURE OF THE SOUTHERN FORESTS.

The question arises, how long will this great forest, more especially the most valuable portion, the long-leaved pine, last? On this question authorities differ. Recent writers estimate that, at the present rate of consumption, the pine supply in Texas will last 250 years; in Louisiana, 100 years; in Mississippi, 150 years; in Alabama, 90 years; in Georgia, 80 years; in Florida, 30 years; in Arkansas, 300 years; in North Carolina, 50 years, and in South Carolina, 50 years.

Dr. Mohr estimates that in 1880, 200,000,000 feet of lumber found outlet at Pensacola, 60,000,000 feet at Mobile, 60,000,000 feet at Pascagoula, 36,000,000 feet from Pearl River at Bay Saint Louis, 13,000,000 feet at New Orleans, 12,000,000 feet by the New Orleans and Chicago Railroad, and 12.000,000 feet by the Louisville and Nashville Railroad. This lumber came from the States of Mississippi, Alabama and Florida, and involved the depletion of a little over 200 square miles of forest in a single year. Beside the saw-mill demand, a certain area of the pine country suffers from the ravages of the turpentine manufacturers. In Mississippi and Alabama 150 square miles of forest are destroyed every year. Taking the consumption in Alabama and Mississippi as a basis, Dr. Mohr estimates the duration of the pine forests of the Gulf States at 100 years. It is certain, however, that the present rate of consumption is not a criterion for the future. The railroad system of the South, which has already added so much to the consumption of lumber, will extend, and beside, a completed railroad is a constant consumer. As the cities of the South grow, the local demand for building lumber increases, and every manufactory of any sort is a consumer. With the spread of railroads the ravages of fire become more extensive and destructive. At present, southern lumber, pine or cypress, has not found its way in quantity into the great prairie States west of the Missouri, but should it enter that region on terms to compete with the white pine from the North, a great demand would result.*

These are the reasons which seem to indicate Dr. Mohr's estimate of the duration of the pine forest in the South as too high. On the other hand, while the yellow pine is a slow grower, trees which furnish logs 15 inches in diameter are not less than 150 years old. When cut off it is succeeded by other varieties, such as the short-leaved pine and the loblolly or old field pine, which grow rapidly, and as the second growth appears on land which is good for little else, there is no occasion for its destruction and abundant reason for its preservation.

FORESTRY IN THE SOUTH.

In what has been said no special mention is made of the valuable hard woods of the South, now being utilized in the home manufacture of furniture, wagons and many other articles; nor has attention been called to the tar, pitch and turpentine industry, which has made North Carolina famous. The great gulf lumber region has been mentioned because of its great value and remoteness; enough has been stated, however, to give an idea of the great forest interest in the South, which just now stands in need of intelligent protection. The ownership of the public lands is vested sometimes in the State, sometimes in the United States and sometimes in both, within the limits of the same State. Both proprietors should use their authority to prevent waste of the

* Since this report was written large quantities of Southern pine have been sent to the markets of the North and West.

forest. As the State of Texas has passed a law to prevent pecan gatherers from cutting down and destroying trees for the sake of the nuts, so it can punish by statute persons who rob State timber lands, set fires, or commit other depredation or damage. The United States Government can and should exercise similar vigilance to diminish the destruction of the forest by the turpentine distillers. Dr. Mohr makes the following suggestions:

1. No tree under the size fitting it for the saw-mill should receive more than one box, and all trees of a size so small as to be destroyed by boxing should be left untouched.

2. The practice of firing the turpentine orchards every spring to remove combustible material from the ground should be dispensed with.

3. The waste products of the saw-mills (slabs, sawdust and the like) should be utilized by a process of direct distillation.

In every State in the South, State forestry associations should be organized. These would serve the purpose of similar societies in the Northern States in encouraging the growth and preservation of forest trees, with the additional advantage of advertising the forest resources of the South. The South is, to all intents and purposes, a new country and needs advertising. The published transactions of such societies circulated all over the United States and Europe, would prove superior immigration documents.

Leaving the South, we turn now to a country quite unlike it, and speak of the vast area between the Missouri River and the Rocky Mountains.

FORESTRY IN KANSAS.

While Kansas has not as yet organized a State forestry association, the matter of forest-tree growing has always occupied a great deal of attention at the meetings of Kansas agricultural and horticultural societies. Whatever indifference may exist elswhere, the people of Kansas, in town and country, are fully alive to the importance of tree-planting. The trees of Kansas have been classified by Professor Snow, of the State University and others, and knowledge has been disseminated through the agricultural press. The biennial reports of the State department of agriculture, which have attracted attention throughout the Union, have treated the subject fully and freely. The present season opened early, and consequently the arbor day appointed by proclamation of the governor came too late; but prior to the appearance of the proclamation the work of tree-planting had been accomplished. Hundreds of thousands of trees were planted in cities, towns and villages. In some instances the municipalities purchased the trees and furnished them to persons desiring to plant. The planting was followed by one of the finest growing seasons known in the history of the State, and the trees made a fine growth, insuring their permanence, and in future years the work of the season of 1883 will be evidenced by rows of forest trees lining the streets and filling the parks and public grounds of Kansas towns. The favorable season has produced a marked and perceptible effect on the natural forest growth of the country. This growth is now seen at the extreme western limits of cultivation in the State, making its way up and beyond the banks of the streams under which it was driven to take shelter from the prairie fires. Many of the swift Western streams are now dammed at frequent intervals to furnish power for water-mills, and along these bodies of standing water the effect is visible. Kansas affords a fine field for the observation of the forester on account

of its varying altitude, the State being divided into three divisions, respectively averaging 1,000, 2,000, and 3,000 feet above the sea, yet destitute of mountains. The position of the State in the center of the Union, makes it suitable ground to test trees common to the North, South, East and West.

IRRIGATION.

In the "Preliminary Report," heretofore alluded to, considerable space was devoted to the questions of forestry and irrigation considered together. Having demonstrated that there is nothing in the soil or altitude of the great plains of Western Kansas and Eastern Colorado to prevent the growth of trees, the only requisite lacking being a generally diffused supply of water, it was suggested that the water in the streams which flow through the plains be brought to the trees. That this theory is correct, namely, that the trees need only water, is unquestionable. Says Mr. C. H. Longstreth, a veteran tree-grower in the West and in Kansas:

"We have in any of the soils of Kansas an unlimited supply of plant food or fertilizer, enough and to spare for all tree growth. All we want is to place the fertilizer so the trees can use it. Water is the only agent so far known that will do this work. The value of water as a nutriment or as a means of conveying nutriment to plants depends, however, on certain facts in vegetable physiology that are not generally considered. Growing plants contain from 70 to 95 per cent. of water. To the extent that water supplies this necessary constituent of a growing plant, it is an actual nutriment. The solid portion of the tree consists of matter which enters it only while in solution in water. If water is not adequately supplied an insufficient quantity of nutriment will be carried into the circulation of the tree or plant, and its growth stunted or arrested altogether. No fertilizer or food can enter any plant except in solution in water. Neither does water enter any part of a plant except its roots. The idea advanced by some that water is ever absorbed by the leaves of a plant is unfounded. To apply water to trees just when and where it is needed involves a system of irrigation."

If Mr. Longstreth's theory be correct, the best results in tree growing may be attained by the ditch system of irrigation, which consists in running the water along the surface near the roots of the trees.

The irrigation experiment at Garden City, Kans., near the line of Colorado, noted in the "Preliminary Report," is still in progress. In April and May the Arkansas River, which is depended upon to supply the farms and gardens at Garden City, failed to flow, no water save in pools being seen in its bed for a long distance. This occurred just at the planting season, or rather at its close, and the doubters as to the practicability of irrigation seemed to be in the majority. But before the end of May, the water came and filled the ditches, and the trouble throughout the season has been a surplus rather than a deficiency of water. While the water is primarily intended for watering farm and garden products, trees are everywhere set out on the borders of the ditches, and the results are important to the interests of forestry. The progress of the Garden City experiment has stimulated the running of ditches at Kinsley to the eastward, and at Medway to the westward of Garden City, the distance between these points being 147 miles. Success will transform the face of the Upper Arkansas Valley. Without indulging in triumphant prophecies, it may be said that no irrigation enterprise in Colorado or Kansas has ever yet been abandoned, nor seems in prospect of failure, and with the water come the trees.

ARTESIAN WELLS.

Within the last six months fifty artesian wells have been successfully bored in the city of Denver, furnishing a great supply of

water. The depth of these wells is 325 feet, the bore of the wells being 4 inches. This seems to reveal the existence of a great subterranean stream beneath the city. Whether the supply of water will be sufficient to aid in the growth of trees is undetermined; but it should be noted that, under the burning sun of Mexico, large trees are kept alive and growing along the streets and alamedas by a little stream only a few inches wide, coursing at their roots. The wells so far bored have revealed no diminution in the hidden reservoir from whence the water comes, and though the wells may increase in number indefinitely, this may continue to be the case. When we consider that there is a bored well at Artois (from whence we derive the name "artesian") that has kept up its flow for one hundred years, and when we remember that the great artesian well at Passy, near Paris, throws 5,582,000 gallons per day, we can gain some idea of the possibilities of irrigation by means of artesian wells. The same amount of water which would irrigate an acre of field crops would undoubtedly be sufficient for an acre of trees.

COLORADO.

Forestry is receiving some attention in Colorado, but in that country irrigation must precede any cultivation of the soil. This fact is now fully recognized, and the irrigating ditches are year by year extending in the valley of the Arkansas and other streams. The triumphant success of the pioneer experiment at Greeley has settled the question for Colorado. Dr. Collier, of Pueblo, has commenced an irrigation ditch on the Arkansas, in Bent County. This may be said to be midway between the existing Kansas and Colorado systems of irrigation and tree-growing. Dr. Collier's success will divide the present treeless waste of about 200 miles, and will settle the question of the reforesting of the expanse, at least so far as the banks of the Arkansas are concerned.

NEW MEXICO.

The American settler, who is now coming to the front in all New Mexican enterprises, adopts some of the ideas of the native Mexican. He recognizes the value of the adobe as building material, but covers his house with an American shingle roof. He recognizes, too, the necessity and value of irrigation, and will introduce ditch-digging machinery, and within the coming twenty-five years do more than has been done by the native Mexican population in three centuries. While he is a ruthless destroyer of the native forest, he plants trees around his dwelling, and in some instances brings blue-grass sod for 600 miles to grow near his door. American enterprise will some day transform the valley of the Rio Grande, and widen its present narrow belt of green; but probably some future forestry association in New Mexico will deplore the present destruction of the mountain forest.

ARIZONA.

Arizona Territory is a vast country, containing an estimated area of 113,916 square miles, or 72,906,240 acres, nearly the united area of New York, Pennsylvania, New Jersey, Maryland, and Delaware. It is now crossed by two great lines of railroad, one of them, the Atlantic and Pacific, having been but recently completed. Of this great domain, the United States still retains the ownership of the greater part. It is therefore practicable here for the Government to exercise its authority for the preservation of the existing forests, the encouragement of tim-

ber-culture, and the regulation and encouragement of irrigation. Much of the country may seem a desert to the passing traveler on the railroads; yet regions now barren, once supported a numerous population, which have left traces of their occupation in the outlines of canals many miles in length. These people disappeared, it is believed, on account of the hostile incursions of savage Indians, and denudation of the forest lands. Now that the country is being again occupied by man, the trees should come back with him, and they may and will return if an enlightened policy is pursued, first by the General Government and afterward by individuals. The forest lands of Arizona are scattered in tracts, the greatest bodies of timber being in Yavapai and Apache Counties. The great body of the timber in Arizona grows upon the slopes of the San Francisco Mountains; the great mountain which gives its name to the range rising from the desert plains, and showing its dark, pine-covered sides for an immense distance. Here is a body of pine forest 150 miles long by 75 miles wide. The title to this great forest remains in the General Government, save the odd-numbered sections granted to the Atlantic and Pacific Railroad Company. The process of spoliation has, however, already begun. The natural forest has no undergrowth, but now fires are set in the débris left by the portable saw-mills, the railroad-tie cutters and the charcoal burners, and great destruction ensues. So vast is the tract, however, that much of the timber is yet unharmed; but the spoiler is at hand. One party has a contract to furnish 30,000,000 feet of lumber to a railroad in Mexico. He has put in a number of saw-mills on the line of the Atlantic and Pacific Railroad, and is turning out lumber in the shape of sawed ties, bridge timbers, &c. He is supposed to be drawing his supplies from the lands granted to the Atlantic and Pacific, but he is, in fact, cutting down the property of the United States as well as that of the railroad company; and as if that were not enough, fires spread from the cleared sections to burn up the untouched forest. Agents of the Government are presumed to keep a watchful care of the property of the Government, but they do not put in appearance, as a rule, until after the lumber has been stripped, and then are supposed to collect a small amount on each stump. In point of fact, it is believed by those conversant with the matter, that but a fraction pays stumpage. The writer was told by a responsible gentleman that after an immense amount of timber had been cut from the Government lands in the vicinity of Trinidad, Colo., an agent of the Government appeared, and to use an expression common to that country, "rounded up" a lot of timber cutters, and after a consultation lasting nearly an entire night, accepted $900 as compensation for the trees which had been cut. What is done in Colorado will be done in New Mexico and Arizona. The Government ought not to suffer itself to be thus despoiled and trifled with.

The waters of Arizona belong to the United States, as do the lands and the forests, and the Government should take steps to assume control of the irrigation, so that none of the tillers of the soil shall be cut off from water. Hinton's "Hand-book of Arizona" estimates that there are about 2,800,000 acres of land of the best quality in the Territory with surface water to sufficiently irrigate the same by reasonable expenditure on ditches. The same authority estimates that there are 10,000,000 acres, perhaps 15,000,000 or 20,000,000 acres, of rich land which can be irrigated by means of artesian wells, such land as when thus made available, is sold in Los Angeles and San Bernardino Counties, California, for $100 an acre, with the difference that the average depth of water in Arizona would probably not be half so great as in the counties above named.

RAILROADS AND TREE-PLANTING.

In the "Preliminary Report," the writer adverted to the advantages which would result to the country and the railroad companies if the latter would engage in and encourage the growth of trees, and he takes occasion to repeat here that, next to the General Government, the land-grant railroad companies are the greatest land-owners on the continent. They have received much from the people, and they should give something. In the improvement of the country they make a return for a magnificent gift, and promote their own interest. A gentleman who planted trees at the stations along the line of the Union Pacific Railroad, in Nebraska, and who therefore is in a position to judge of the practicability of tree-growing in that region, writes:

"I have urged the planting along the line in Nebraska in tracts of 40 acres or more using mainly the catalpa, for a future tie supply. I argued this for the reason that the example would cause large planting by the farmers, who, in time, would market their ties, which the railroad wanted, as they would any other crop. The effect on the climate, increased production of crops, protection to man and beast, orchards, and vineyards, were mentioned. The Government has given the railroads a great domain from which they are realizing great return. Why should they not spend a very small fraction of the money received from the sale of their lands in aiding the Government in its attempt to secure a growth of forests on the treeless plains, and at the same time further their own interests? Forest planting should not be delayed, and I hope that our road may be induced to order the breaking done the coming spring. After the great damage and loss to western railroads, which suffered to the amount of half a million dollars two years ago, I should think the question of economy would present itself. I have seen this season, a hundred miles west of here, miles of white willow wind-breaks, on farms and by roadsides, twelve feet high, three years from the cuttings. One, or in the most exposed places, two lines of these would be an effectual protection from snow. At the same time I would grow a row of red cedars, Scotch pine, or any other close, hardy evergreen, and when of suitable height cut away the willows, the wood of which would pay all expenses, and leave a line of beauty, pleasant to the eye of the passenger in all seasons."

Why should not suggestions so sensible and practical be carried out? We must hope the time will come when tree-planting will not be considered a mere experiment, or a matter of beauty rather than of use, but as a wise investment. In this connection it may be said, if a railroad is short-sighted that does not provide itself with snow-belts and plantations for furnishing ties in the future, a railroad company is yet more deficient in judgment that, possessing timber, allows it to be burned up or totally cut off. The Missouri, Fort Scott and Gulf Railroad Company continues its tie plantations at Hunnewell and Farlington, Kans., under a contract with R. Douglas & Son, of Waukegan, Ill.

SCHOOLS OF FORESTRY AND EXPERIMENTAL FARMS.

While entertaining the greatest respect for the wisdom and experience of the gentlemen who composed the forestry congress at Saint Paul in August, 1883, the writer takes occasion to renew the expression of his belief that the Government of the United States *should* establish and maintain schools of forestry and experimental farms. The objection urged, that there is not at present a demand for trained foresters, may be well met by the reply that the *Government needs trained foresters.* As well say that in time of peace there is no demand for trained army or navy officers, and so suspend or abolish the academies at West Point and Annapolis. The Government of the United States owns a vast forested domain needing care and protection. From what has been already said in reference to Government timber lands in Arizona and Colorado, it is clear that Government forests do not receive commen-

surate care or protection. Would it not be better to trust this great property in the hands of a corps of men educated by the Government, as are our army and naval officers, and feeling the same sense of professional honor in regard to their duty to the Government, than to confide these interests to men hired at so much a day and with no special interest in the performance of their duty? From the foundation of the Government till now the forests of the United States have been robbed and despoiled. The timber has been cut down by individuals and sold for their own use and benefit. To steal Government timber has not been regarded as a penal offense, if indeed any offense at all, and the local officers of the law, Federal or State, are not apt to rise above the prevailing standard of morals or popular construction of law in their respective localities. What is needed is a corps of agents, strangers to the locality, absolutely incorruptible and indifferent to local opinion, to see that the Government is not robbed under any plea whatsoever. Should the Government adopt the policy, which readily suggests itself as best, that of disposing of such timber as cannot be profitably left standing, the work of selection should be in the hands of trained and competent men. And where could such men be better trained than in a Government school of forestry?

Every reason that can be offered for the existence of the Department of Agriculture itself can be presented in behalf of the establishment of one or more schools of forestry. The establishment of experimental farms or plantations is, of course, a necessity that arises with the schools. In no other way can forestry be taught; and moreover, these experimental farms afford the only opportunity for testing the vast variety of soil and climate as affecting tree growth in the United States. The tree that flourishes in New England may be impossible of cultivation, or worthless, if grown on the prairies of Kansas or Nebraska. The necessity for irrigation exists in some sections and not in others, and incredulous as many may be, on the success or failure of irrigation depends the question whether millions upon millions of acres of this land of ours shall be cultivated and made habitable, or remain desolate and treeless wastes. What better means can there be for testing this question? How can needed knowledge in regard to it be better obtained than by experiments conducted under the authority of the United States? Again, it is by no means certain that there is not now, or will not be in the near future, a demand for trained foresters. The State of New York, after years of neglect, is now endeavoring to reclaim its lands and care for its forests in the Adirondack region. Other States may follow the wise example; railroads owning timber lands may wish them cared for, and private owners of forest lands may desire advice or assistance. It should be remembered that the time is coming when even Americans will estimate trees at their true value. Let the Government of the United States at least encourage such recognition, and provide the country with a trained corps of foresters, and with experimental forestry stations.

PREVENTION OF FIRES.

The ravages of forests by fire are usually preventable. They are the result of culpable carelessness or willful wickedness, but they can be prevented only by prompt and vigorous treatment. It should be made the business of certain specified agents or officers to bring forest incendiaries to punishment. Experience has shown that the general duty

of everybody is seldom performed by anybody in particular. Nothing can be more wicked or senseless than the setting of prairie fires, yet property and life are destroyed by them every season, and scarcely, if ever, is any person convicted or even complained of, although the laws of every prairie State are sufficiently explicit. The same rule obtains in regard to forest fires.

THE TIMBER-CULTURE ACT.

The weakness of the present timber-culture act has been often demonstrated to the Department. The purpose of the act is good, and its operation has been generally beneficial, but there needs to be embodied in the act as it now stands, provisions against fraudulent entry, and more especially does this law need to be amended in accordance with the rule, "Once a timber claim always a timber claim."

WILL THE FOREST RENEW ITSELF?

It is held by many observers in the West that the forest will renew itself if merely protected from fire and waste, and there seems to be much ground for this belief. It is certain that there is much more timber in the prairies of Illinois than there was in the earlier settlement of the country. There are now to be seen great tracts of valuable second growth where forty years ago the ground was covered with what, in the parlance of the country, is called "hazel rough." This has come about, not because any particular system or method has been adopted for preserving the forest, but simply because farmers have found the prairie best adapted for farming, and they have not, as did the earlier settlers, devoted their time to the slavish labor of clearing out fields in the timber. There was a great demand for rail timber for fences when the country was settling up, but hedges and other substitutes have supplanted rails, and so the timber has been spared that draft. Then coal coming into general use as fuel has cut off a portion of the demand for firing. Under these conditions, as we have said, the timber is increasing in some of the older Western States, and notably in Illinois. In Kansas the wood increases steadily in the eastern portion of the State, from the same causes cited above, and from an appreciation of the value of trees which did not prevail among the earlier settlers of the older West. The tendency of settlement in Kansas has been to change first the character of the grasses. The buffalo grass, which originally covered the ground with its short detached stools or bunches, gives way to a tall, rank grass. Sunflowers grow by the thousand, with weeds unknown before. The sumach begins to spring up in the edge of the narrow skirt of timber along the stream, and makes its way out into the prairie, especially if it can find the shelter of some friendly "draw" or hollow. All these things seem to indicate that the effort of nature is to produce a coarser and ranker growth, which it is safe to say might, in time, culminate in tree growth. Could a tract of prairie skirting a body of natural timber in Kansas or Nebraska be inclosed and absolutely kept from the tramping of cattle, the ravages of fire and the ax for a term of years, the presumption is strong that it would soon be covered with undergrowth of various kinds, and eventually with trees. This question of the recuperative force (if I may use the expression) of the forest deserves careful observation, and the results of observers should be collected by the Department.

TREE-PLANTING ON ROADS AND STREETS.

In France there are over 3,500,000 trees growing along the high roads. In districts favorable to their growth, these are usually nut-bearing trees; in other districts the mulberry is planted, thus combining beauty and use. Every American traveler in France notices these trees, and yet he comes from a country with infinitely greater natural forest resources than France. The roads in his own country are unsheltered for miles from wind and sun, and he grows enthusiastic over the shady and beautiful French highways. In France the tree-planting is done, it is true, under governmental regulations, but these regulations are supplemented by intelligent co-operation on the part of the people. The general law in this country respecting highways emanates from the State, and is carried out, after a fashion, by local road overseers, &c.; yet there is no doubt the power which compels the working of roads could make tree-planting compulsory. It would be better, however, to have it voluntary, and it is to be hoped the day will come when an enlightened sentiment will lead to the shelter and protection of our public roads by continuous lines of trees. As a beginning, intelligent farmers should co-operate by neighborhoods; horticultural and agricultural societies, farmers' clubs should take the matter in hand, and forestry clubs in school districts or townships might be formed to give the matter individual and collective attention.

THE NECESSITY OF EXPERIMENT.

The great interest which exists in the subject of forestry, though it exists in what may be called a diffused condition, is shown by the number of letters received by the Commissioner. Some of the writers are doubtless mere theorists, but others are men of practical experience in tree-growing, though it is but just to say there is almost or quite as much difference of opinion among these last as among those who deal in theory alone. As an illustration, the writer is in receipt of a letter from Virginia, suggesting the cultivation of the yellow pine in Kansas, urging that it is the hardest and most prolific of the pine family; that, with a good subsoil, it will stand any drought or climatic change, and in four years from the seed will average from 15 to 20 feet in height, as it grows in Virginia from 25 to 30 feet high in seven years, and on the poorest kind of soil. The yellow pine would certainly be a great boon to Kansas, but to the suggestion of its introduction the writer can only return his thanks. Nurserymen could do something; the railroad companies could, if they would, institute experiments that would determine the question as to the adaptability of the yellow pine to this latitude, and individuals might pursue investigations on a limited scale. But the best results could be obtained only by means of trial at experimental stations under the patronage and direction of the General Government. Such a station west of the Missouri would in a few years settle many vexed questions, and give intelligent direction to the labors of the forester in the region which needs him most.

THE GENERAL DUTY OF THE GOVERNMENT.

One of the questions propounded by the Department is, "What should the General Government do for the preservation and increase of forests on the public domain?" To this question it may be replied that the first thing the Government should do is to consider its forest domain as separate and apart from every other. The rules and regulations which

apply to the prairie should not be made to govern the sale, &c., of the timber lands. The extent of the forests still belonging to the United States should be ascertained and considered separately.

To begin with, the Government should stop the wholesale spoliation of these lands by private individuals or corporations, and whatever the means necessary to this end should be applied promptly and efficiently.

The Government should, as a rule, withdraw its timber lands from sale or occupancy. To sell them does not promote the settlement of the country; it only enables some individual to obtain for his own benefit timber at less than its value.

The Government should make the custody and care of its forest domain the particular charge of officers who regard the interests of the Government. These officers should have regular stations and prescribed districts of country assigned them, not mere roving commissions.

The Government should impose necessary regulations to prevent the wholesale destruction of its forests by fire.

This should be done by the General Government to protect and preserve its own property. Further than this, the General Government should encourage the increase of the tree area in the country. It should do this by first disseminating information. It has been shown that the present agencies at work are not sufficient. The Government should supply the people, to some extent at least, with instruction on this great subject. It should be furnished in the shape of reports and other printed matter, issued at frequent intervals in convenient form, free from discussions remote from the points at issue before the people, and free from technical terms unintelligible to the masses.

The Government should establish collections, accessible to the people, of the woods of the United States. These collections can best be made under the directions of the Government, and they should not be kept at Washington exclusively, but at as many different points as possible. The agricultural colleges in the various States would be suitable depositories and, where States maintain agricultural departments, the offices and rooms of such departments.

Finally, the Government should make it understood that forestry and its ally, irrigation, are interests which are to be fostered in common with the general interests of commerce and agriculture. In conclusion, I submit, as evincing the interest our neighbors of the Dominion of Canada feel in the question of forest preservation, and as containing ideas of value, the following extracts from a letter from a Canadian gentleman:

"A little more than one hundred and fifty years ago Europe was awakened to the fact that her timber supply was being gradually exhausted; the forests were either in private, municipal, or ecclesiastical hands, or so saddled with private rights that the states had no adequate control of them.

"The consequences apparent were exploitation of immature timber to the serious depreciation of the annual yield; the consequent want of first-class timber for shipbuilding and other important works; the destruction of seedling trees by cattle, resulting in a scanty crop of low, bushy trees. In a word, the area was being gradually contracted and the annual yield reduced so much by mismanagement and neglect, that it fell below the annual consumption; capital stock was being strengthened on a condition under which utter exhaustion becomes a mere question of time.

"Austria, Germany, and France rose to the emergency; they extinguished private rights, introduced state control, and demarcated the areas to be maintained as permanent forest. Germany reserved a third of her total area as forest; Austria, a trifle less; and France nearly a fourth. Their aim was to increase the timber production to the highest capacity of the reserved area, and to limit annual exploitation to annual increment.

"Forest management in all these countries is now a great state industry, scientifically conducted It is under the control of a specially trained department. The

remedial measures have exercised an important bearing on the well-being of the countries named, and what is more to the purpose, the undertaking has proved remunerative. The timber and other forest products yield a revenue, leaving a margin of profit on all costs, including rent of the land.

"In America, both the States of the Union and provinces of the Dominion have already passed the stage at which remedial measures were introduced in Europe, and the outlook is a far more serious one for us, firstly, because our population is growing at a rate unparalleled in the past, and secondly, because the whole interior of the North American continent depends now, and must continue to depend, upon the Atlantic and Pacific States for the great bulk of its timber.

"The saddest feature in the American timber problem is that the people have not yet shaken off the old tradition that "timber land is worth the value of the land less the cost of clearing." The stock of American timber is now so reduced that if artificial causes were not at work to keep down prices, there is not an acre of timber land on the North American continent that could not be sold for the amount which it would cost to reprodnce it.

"These artificial causes referred to are on the surface. England with her wealth of iron and coal, favored by her insular position and large foreign trade, did not trouble herself about growing timber as long as she could supply herself from the supposed inexhaustible supplies of northern Europe cheaper than she could grow it. She consequently supplied herself from Sweden and Norway, which possessed large natural forests costing nothing. England was a first-rate customer to these countries, and in due course North America began to compete for a share of the trade; the market was overstocked, and prices naturally fell to the narrowest possible margin on cost of bringing the timber to market.

"In the struggle Sweden and Norway have denuded their natural forests, and are now organizing measures for restocking them at about three times the price at which they sold their natural crop.

"As a consequence, America has the monopoly of the English trade, an enormous home demand is being rapidly developed, and her stocks are undergoing such rapid exhaustion that, withholding supplies, she could command prices undreamed of by the most visionary. But in the face of these facts the Government of the United States and the Dominion leave the control to private parties who, in a spirit of competition, go on flooding the markets to their own and the national detriment.

"Good pine timber requires a century for its development. There is as much timber now growing on the American continent as, with proper management and restriction of exploitation to ascertained annual increment, would avert a severe timber famine. But if the problem is not soon grappled with, America will ere long be dependent on Europe for her timber supplies.

"The position is too critical for temporizing or half measures. The difficulty can only be met by the resumption by the State of untrammeled control of its remaining forests. This is an heroic measure, but nothing less would save the country. It would be costly, but the most pecuniarly profitable investment the State ever entered on. The problem is so grave as to demand the most careful consideration of the ablest advisers of the Union and Dominion Governments, and much would be gained if the two would operate harmoniously on a prearranged basis.

"If the programme I have suggested were adopted conjointly by the Union and Dominion Governments, existing stocks held back, and felling stopped for three years to work off private stocks and let the demand make itself felt, prices would go up with a bound, and I do not think they would stop far short of $200 per mille, American quotations."

At such rates the remaining forests, instead of hastening to extinction, would be permanently revenue-producing, besides yielding a fund to meet the costs of a measure of forest administration commensurate with the future requirements of the continent.

Respectfully submitted.

F. P. BAKER.

TOPEKA, KANS., *September* 10, 1883.

REPORT ON KINDS AND QUANTITY OF TIMBER USED FOR RAILROAD TIES.

By F. B. HOUGH, *Agent of the Department.*

I have the honor to submit herewith the result of inquiries ordered by the Department of Agriculture, having reference to the use of railroad ties, the sizes and number used, the kinds of timber employed, the preferences to which experience has led as to the kinds and age of the timber employed, and such other practical questions as might arise concerning their preparation and use, so far as could be ascertained by means of circulars addressed to the superintendents of the various lines of railroad within the United States.

In addressing these circulars, reliance was placed upon the names and residence of these officials as given in the last edition of Poor's Railroad Manual, with occasional reference to railway guides. The replies being entirely voluntary, there were no means available for rendering the inquiry complete. Still, the interesting questions involved in the subject, and the practical advantages apparent, secured the attention of a large majority of the persons to whom the circular was sent, and we are able to present the results from 283 different corporations, including 697 branch or connecting lines, and representing in all 70,889 miles of track.

The data thus obtained will afford a reliable means for estimating the total results that would have been shown had the returns been absolutely complete. As they come from widely different regions, and include returns showing the durability of a great variety of timber trees, they will afford the means for comparison concerning the effects of climate and soil upon the durability of the wooden structure of our railroads, and will present a useful means of comparison for the future.

The circular used in collecting these data, was as follows:

(Forestry Division.—No. 5.)

DEPARTMENT OF AGRICULTURE.

INQUIRIES CONCERNING THE USE OF TIMBER FOR RAILROAD TIES.

Name of railroad company reporting: ———.
Name of person who prepares this report: ———.
Post-office address: ———. Date: ——— —, 1882.

Lines of railroad to which this report applies.

From—	To—	Miles of track.			Remarks.
		Single.	Double.	Sidings.	

Timber used for ties—its size, durability, and cost.

Kinds of timber.	Length (feet).	Breadth (inches).	Depth (inches).	Average durability.	Cost per tie delivered.	Remarks.

From what region chiefly procured? ———
Number of ties used to a mile? ———
Season when cut? ———
Preparation by seasoning, &c.: ———
Preserving processes employed, and with what result? ———
Preferences of sawn or hewn ties: ———
Preferences of large timber sawn, or of trees that make but one tie to a length:—
If any experiments have been made for testing the durability of ties, either by the mode of securing the spikes, supporting above the soil upon broken stones as a ballast, or otherwise, please mention the nature of the experiment and its result. Any other facts noticed relating to the number of ties procured from an acre of timber land—the time required to grow a new crop of trees large enough for ties—the effect of soil, &c., upon the quality or durability of the timber, &c.—may be written upon the blank page under the head of "Remarks." If experiments in planting have been undertaken by the company, mention the name and address of the person who could give information, in order that a special blank may be sent.
Remarks: ———

To avoid repetition, the names of the several railroads reporting, the names or connected points of branches or leased lines, and the number of miles of single and double tracks and of sidings will first be given, and numbers will be prefixed, by which reference may be made in the tables that follow. The miscellaneous and widely different statements relating to the kinds of timber used, its durability and cost, and returns of various other facts, information, or suggestions which do not admit of tabular statement, will be arranged under the numbers assigned to the several railroads as given in the first table, for which see concluding remarks, pages 149, &c.

TABLE I.—*Names of companies reporting, with the names of branches or connected lines and the length of track of each.*

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
1	Adirondack Railway: Saratoga Springs to North Creek, N. Y.	60.00	.....	2.75	62.75
2	Alabama Great Southern R. R.: Chattanooga, Tenn., to Meridian, Miss.	290.00	.....	.....	290.00
3	Allegheny Valley Railroad:				
	a. River Div.: Pittsburgh to Oil City, Pa.	132.00	11.80	.....	282.80
	b. Plum Creek Br.: Verona to Coal Works, Pa.	7.00	.....	.....	
	c. Low Grade Div.: Red Bank to Driftwood, Pa.	110.00	.....	.....	
	d. Sligo Branch: Lawsonham to Sligo, Pa.	10.20	.....	.....	
4	Alexandria and Fredericksburgh Railway:				
	a. Alexandria and Fredericksburgh, Ry.: Saint Asaph Junction to Quantico, Va.	28.64	.....	3.13	41.88
	b. Alexandria and Washington R. R.: South end Long Bridge, Washington to Alexandria, Va.	1.33	8.63	1.52	
5	Arkansas Midland R. R.: Helena to Clarendon, Ark.	48.00	.....	5.00	53.00
6	Ashburnham R. R.: Ashburnham to Ashburnham Junction, Mass.	2.75	.....	.25	3.00
7	Ashuelot R. R.: South Vernon, Vt., to Keene, N. H.	24.00	.....	2.75	26.75

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
8	Atchison, Topeka and Santa Fé R. R.:				
	a. A., T. and S. F. R.: Atchison, Kans., to State Line	470.00	.....	79.00	
	b. P. and A. V. R. R.: State Line to Pueblo, Colo.	149.00	.....	12.00	
	Pueblo to Rockwell, Colo.	36.00	.....	4.00	
	La Junta, Colo., to New Mexico State line	97.00	.....	7.00	
	c. N. M. and S. P. R. R.: New Mexico State line to San Marcial, N. Mex	354.00	.....	44.00	
	Lamy to Santa Fé, N. Mex	18.00	.....	1.00	
	d. R. G. M., and P. R. R.: San Marcial to Deming, N. Mex	128.00	.....	10.00	
	Rincon, N. Mex. and Texas State line	58.00	.....	4.00	
	e. R. G. and El. P. R. R.: Texas State line to El Paso, Tex	20.00	.....	8.00	1,907.00
	f. P., H. and D. S. R. R.: Pleasant Hill, Mo., to Cedar Junction, Kans	45.00	.....	1.00	
	d. K. C., T and W. R. R.: Kansas City, Mo., to Topeka, Kans	62.00	.....	10.00	
	h. K. C., E. and S. R. R.: Emporia to Howard, Kans	76.00	.....	5.00	
	i. F. E. and W. V. R. R.: Florence to Douglas, Kans	54.00	.....	3.00	
	j. M. and M. P. R.: Florence to Ellinwood, Kans	99.00	.....	7.00	
	k. W. and S. W. R. R.: Newton to Wichita, Kans.	27.00	.....	2.00	
	l. C. S. and F. S. R. R.: Wichita to Caldwell, Kans	56.00	.....	3.00	
	Mulvane to Arkansas City, Kans	36.00	.....	2.00	
	m. H. C. R. R.: Sedgwick to Halstead, Kans	9.00	.....	.....	
	n. New Mexican R. R.: Las Vegas to Hot Springs, N. Mex	6.00	.....	.....	
9	Atlantic and Pacific R. R.: Albuquerque to Williams, N. Mex	377.00	.....	12.00	389.00
10	Atlantic and St. Lawrence R. R.: Portland, Me., to Island Point, Vt	149.50	.....	.....	149.50
11	Baltimore and Ohio R. R.:				
	a. Main stem and branches:				
	Baltimore, Md., and Wheeling, W. Va	379.00	280.00	141.00	
	Grafton to Parkersburg, W. Va	104.00	.....	28.50	
	Relay, Md., to Washington, D. C.	.....	32.00	7.00	
	Washington, D. C., to Washington Junction, Md	42.75	.....	7.50	
	Alexandria Junction to Shepherd, Md	12.50	.....	1.50	
	Weverton to Hagerstown, Md	24.25	.....	3.50	
	Frederick Junction to Frederick, Md	3.50	.....	2.00	
	Harper's Ferry, W. Va., to Staunton, Va	126.00	.....	12.00	
	Wheeling, W. Va., to Washington, Pa	32.00	.....	2.50	
	Baltimore to Locust Point, Md	5.00	5.00	5.00	
	b. Pittsburgh Div. and branches:				
	Cumberland, Md., to Pittsburgh, Pa	150.00	33.00	33.50	
	Rockwood to Johnstown, Pa	45.10	.....	2.75	2,308.06
	Connellsville to Uniontown, Pa	12.90	.....	1.80	
	Salisbury Junc. to West Salisbury	8.70	.....	3.50	
	Hickman to Cora Mines, Pa	2.20	.....	.....	
	Garrett to Berlin, Pa	8.10	.....	0.30	
	Bradford to Standard, Pa	10.00	.....	1.90	
	c. Trans-Ohio Divisions:				
	Bellaire to Columbus, Ohio	137.29	.....	46.53	
	Newark to Straitsville, Ohio	44.00	.....	5.63	
	Newark to Sandusky, Ohio	116.25	.....	28.11	
12	Baltimore and Ohio and Chicago R. R.: Chicago Junction, Ohio, to Chicago, Ill	262.60	.....	51.84	314.44
13	Baltimore and Potomac R. R.:				
	a. Main line: Baltimore, Md., to Washington, D.C.	26.02	17.36	14.24	126.15
	b. Pope's Creek line: Bowie to Pope's Creek, Md	48.70	.....	2.47	
14	Bangor and Piscataquis R. R.: Oldtown to Blanchard, Me	63.00	.....	3.00	66.00
15	Bath and Hammondsport R. R.: Bath to Hammondsport, N. Y	9.40	.....	0.50	9.90
16	Baton Rouge, Grosse Tête and Opelousas R. R.: Port Allen to Livonia, La	28.00	.....	1.00	29.00
17	Bellaire, Zanesville and Cincinnati R. R.: Bellaire to Woodsfield, Ohio	42.00	.....	1.50	43.50
18	Bell's Gap R. R.: Bell's Mills to Coalport, Pa	23.50	.....	3.50	27.00
19	Belt R. R.: Brightwood to North Indianapolis, Ind	6.00	8.00	8.00	30.00

TABLE I.—*Names of companies reporting, with names of branches, &c.*—Continued.

No.	Name of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
20	Boston and Albany R. R.:				
	a. Boston, Mass., to Albany, N. Y	.....	202.00	.....	
	b. Cottage Farm to East Boston, Mass	.....	9.00	.....	
	c. Brookline Junction to Newton Highlands, Mass.	1.55	5.34	.....	
	d. Riverside to Newton Lower Falls, Mass	1.22	.....	.....	456.33
	e. Natick to Saxonville, Mass	3.70	.....	.....	
	f. South Framingham to Milford, Mass	13.00	.....	.....	
	g. Millbury Junction to Millbury, Mass	3.00	.....	.....	
	h. South Spencer to Spencer	2.18	.....	.....	
21	Boston and Lowell R. R.:				
	a. Boston to Lowell, Mass.	.....	26.09	.....	
	b. Somerville to Lexington, Mass	8.20	.....	.....	
	c. Milk Row to Mystic Wharf, Mass	2.23	.....	.....	
	d. Montville to Stoneham, Mass	2.26	.....	.....	
	e. Winchester to Woburn, Mass	1.92	.....	.....	
	f. Lowell to Lawrence, Mass	13.40	.....	.....	
	g. Tewksbury Junction to Salem, Mass	18.51	.....	.....	208.73
	h. Wilmington to Wilmington Junction, Mass	3.16	.....	.....	
	i. Operating: Lowell, Mass, to Nashua, N. H	.....	13.64	.....	
	j. Operating: North Chelmsford to Ayer Junction, Mass	13.19	.....	.....	
	k. Operating: Lexington to Concord, Mass	10.53	.....	.....	
	l. Operating: Nashua to Keene, N. H	55.87	.....	.....	
22	Boston and Maine R. R.:				
	a. Lowell Junction to Lowell, Mass	8.50	.....	2.00	
	b. Boston, Mass., to Portland, Me	58.75	56.75	61.00	
	c. Dover to Alton Bay, N. H	28.00	.....	4.00	
	d. Rollinsford to Great Falls, N. H	2.75	.....	1.00	
	e. Newton Junction, N. H., to Merrimack, Mass	4.50	.....	0.50	335.60
	f. South Lawrence, Mass., to New Hampshire line	1.00	2.75	2.00	
	g. Bradford to Georgetown, Mass	6.50	.....	1.00	
	h. Wakefield Junction to Newburyport, Mass	30.60	.....	3.00	
	i. Medford Junction to Medford, Mass	1.00	.....	0.50	
23	Boston, Barre and Gardner R. R.: Worcester to Winchendon, Mass	37.00	.....	09	37.09
24	Boston, Winthrop and Point Shirley R. R.: Winthrop Junction, Boston, to Point Shirley, Winthrop, Mass	3.00	.....	0.25	3.25
25	Boston, Revere Beach and Lynn R. R.: East Boston to Lynn, Mass[1]	2.50	13	1.50	30.00
26	Bradford R. R. and Kinzua R. R.: Bradford to Kinzua, Pa.	28.00	.....	5.00	33.00
27	Brooklyn and Rockaway Beach R. R.: East New York to Jamaica Bay, N. Y	3.50	.....	1.00	4.50
28	Buffalo, Pittsburgh and Western R. R.:				
	a. Oil City to Irvineton, Pa	50.00	.....	4.00	
	b. Oil City, Pa., to Brocton, N. Y	89.00	.....	23.00	
	c. Pioneer to Titusville, Pa	10.50	.....	.....	202.50
	d. Tryonville to Union City, Pa	17.00	.....	3.00	
	e. Oil City to Cranberry Coal Mine, Pa	5.00	.....	1.00	
29	Burlington and North Western R. R.	14.30	.....	.....	14.30
30	Burlington, Cedar Rapids and Northern R. R.:				
	a. Burlington, Iowa, to Albert Lea, Minn	253.00	.....	33.00	
	b. Linn Junction to Postville, Iowa	94.00	.....	4.80	
	c. Vinton to Holland, Iowa	71.00	.....	3.90	571.20
	d. Elmira to Whatcheer, Iowa	71.00	.....	13.50	
	e. Muscatine to Iowa Junction, Iowa	26.00	.....	1.00	
31	Burlington and Lamoille R.R.: Burlington to Cambridge Junction, Vt	35.00	.....	2.00	37.00
32	Camden and Atlantic, and Philadelphia, Marlton and Medford R. R.:				
	a. Main Line: Camden to Atlantic City, N. J	53.05	6.74	17.00	
	b. South Atlantic Branch: Atlantic City and South Atlantic, N. J	5.71	.....	0.33	101.27
	c. Philadelphia, Marlton and Medford R. R.: Haddon field to Medford, N. J	11.70	.....	.....	
33	Cape Fear and Yadkin Valley R. R.: Fayetteville to Gulf, N. C	46.00	.....	0.75	46.75
34	Carolina Central R. R.: Wilmington to Shelby, N. C	242.00	.....	15.50	257.50
35	Catasauqua and Fogelsville R. R.:				
	a. Catasauqua to Rittenhouse Gap, Pa	20.00	.....	7.00	33.00
	b. Breinigsville Branch, Trexlertown to Liberty, Pa	5.00	.....	1.00	
36	Central Pacific R. R.:				
	a. Truckee, Cal., to Ogden, Utah	624.00	.....	.....	770.00
	b. Lathrop to Goshen, Cal	146.00	.....	.....	

[1] Length of road, 8¼ miles; gauge, 3 feet.

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
37	Central Railroad and Banking Co. of Georgia:				
	a. Savannah to Atlanta, Ga	294.25	.....	68.00	
	b. Millen to Augusta, Ga	53.00	.....	5.50	478.25
	c. Gordon to Eatonton, Ga	38.25	.....	2.75	
	d. Barnesville to Thomaston, Ga	16.25	.....	0.25	
38	Central Iowa Railway:				
	a. Manly Junction to Albia, Iowa	177.80	.....	29.90	
	b. Hampton to Belmond, Iowa	22.20	.....	0.70	
	c. Minerva Junction to Stacy City, Iowa	34.60	.....	2.00	
	d. Newburg to State Centre, Iowa	26.60	.....	1.30	
	e. New Sharon to Newton, Iowa	27.70	.....	3.56	408.61
	f. Oskaloosa to Brighton, Iowa	45.50	.....	1.75	
	g. Grinnell and Montezuma Junction to Montezuma, Iowa	13.70	.....	0.60	
	h. Givin to Muchachinock, Iowa	16.50	.....	4.20	
39	Central Vermont R. R.:				
	a. Rouse's Point, N. Y., to Windsor, Vt	158.00			
	b. Bellows Falls to Essex Junction, Vt	128.00			
	c. St. Albans, Vt., to St. Johns, P. Q	43.00			
	d. Montpelier to Barre, Vt	6.00	.....	74.84	527.34
	e. Leicester Junction, Vt., to Ticonderoga, N. Y	16.00			
	f. St. Johns to Magog, P. Q	66.00			
	g. Brattleboro to South Londonderry, Vt	36.00			
40	Charlotte, Columbia and Augusta R. R.:				
	a. Charlotte, N. C., to Augusta, Ga	191.00	.....	12.80	249.20
	b. Charlotte to Statesville, N. C	44.00	.....	1.40	
41	Chateaugay R. R.: Plattsburg to Lyon Mountain, N. Y	34.00	.....	5.00	39.00
42	Cheraw and Darlington, and Cheraw and Salisbury R. R.:				
	a. Cheraw and Salisbury R. R.: Wadesboro, N. C., to Cheraw, S. C	25.00	.....	1.00	
	b. Cheraw and Darlington R. R.: Cheraw to Florence, S. C	40.00	.....	2.00	68.00
43	Chesapeake and Ohio Railway: Richmond, Va., to Huntington, W. Va	421.00	.....	.....	421.00
44	Chicago, Burlington and Kansas City R. R.: Viele, Iowa, to Sumner, Mo	152.00	.....	.....	152.00
45	Chicago and Eastern Illinois R. R.:				
	a. Chicago, Ill., to Terre Haute, Ind	178.30			
	b. Covington to Coal Creek, Ind	9.00			
	c. Danville to Sidella, Ill	22.40	.....	.....	235.49
	d. Otter Creek Junction to Brazil, Ind	12.70			
	e. Wellington to Cissna Park, Ill	13.00			
46	Chicago and Grand Trunk Railway: Port Huron, Mich., to Chicago, Ill	335.00	.....	58.00	393.00
47	Chicago and Iowa R. R.:				
	a. Aurora to Forreston	81.00	.....	10.75	121.55
	b. Flagg Centre to Rockford	24.00	.....	5.80	
48	Chicago and Western Indiana R. R.:				
	a. Chicago to Eighty-seventh street, Ill	.....	9.30		
	b. Eighty-seventh street to Dalton, Ill	7.10	.....	28.00	58.40
	c. South Chicago Junction to South Chicago, Ill	4.70	.....		
49	Chicago and West Michigan Railway: La Crosse, Ind., to Big Rapids, Grand Rapids, Pentwater, and Allegan	405.00	.....	.....	405.00
50	Chicago, Burlington and Quincy R. R.:				
	a. Main line: Chicago, Ill., to Burlington, Iowa	206.00	183.00	.....	
	b. Branch: Geneva to Streator, Ill	69.00	.....	.....	
	c. Branch: Mendota, Ill., to East Clinton, Iowa	62.00	.....	.....	
	d. Branch: Galesburg to Quincy, Ill	99.00	.....	.....	987.00
	e. Branch: Galesburg to Peoria, Ill	53.00	.....	.....	
	f. Branch: Galva to Gladstone, Ill	72.00	.....	.....	
	g. Branch: Buda to Rushville, Ill	110.00	.....	.....	
51	Chicago, Milwaukee and Saint Paul R. R., Dubuque Division:				
	a. Sabata Junction, Iowa, to River Junction, Minn	162.00	.....	23.80	
	b. Volga Branch: Turkey River Junction to W. Union, Iowa	57.50	.....	3.00	
	c. Cascade Branch[1]: Bellevue to Cascade, Iowa	35.70	.....	1.60	368.40
	d. Waukon Branch[1]: Waukon Junction to Waukon, Iowa	22.80	.....	.70	
	e. Preston Branch[1]: Caledonia Junction to Preston, Minn	57.50	.....	3.80	

[1] Narrow gauge; 6 feet ties.

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
52	Chicago, Saginaw and Canada R. R.: Saint Louis to Lakeview, Mich	37.00	.....	6.00	43.00
53	Chicago, Saint Paul, Minneapolis and Omaha R. R.: Elroy, Wis., to Omaha, Nebr., with branches in Wisconsin, Minnesota, Iowa, Dakota, and Nebraska, making in all 1,042 miles of track, not including sidings	.....	.....	.....	1,042.00
54	Cincinnati, Georgetown and Portsmouth R. R.: Columbus to Hamersville, Ohio	35.00	.....	1.10	36.10
55	Cincinnati, Hamilton and Dayton R. R.:				
	a. C., H. and D. Division: Cincinnati to Dayton, Ohio	42.20	16.90	.....	214.20
	b. C., R. and C. Division: New River to Da. W. Junction, Ohio	89.30	.....	.....	
	c. C., H. and I. Division: Hamilton, Ohio, to Indianapolis, Ind	98.90	.....	.....	
56	Cincinnati, Indianapolis, Saint Louis and Chicago R. R.:				
	a. Cincinnati, Ohio, to Lafayette, Ind	171.00	8.50	.....	327.50
	b. Fairland to Martinsville, Ind	39.00	.....	.....	
	c. Valley Junction to Harrison, Ohio	7.00	.....	.....	
	d. Laurenceburg Junction to Laurenceburg, Ind	8.50	.....	.....	
	e. Templeton, Ind., to Kankakee, Ill	56.00	.....	.....	
	f. Rushville to N. Vernon, Ind	44.00	.....	.....	
57	Cincinnati, New Orleans and Texas Pacific R. R.: Cincinnati, Ohio, to Chattanooga, Tenn	336.00	.....	50.00	386.00
58	Cincinnati, Richmond and Fort Wayne R. R.: Richmond to Fort Wayne, Ind	86.20	.....	5.50	91.70
59	Cincinnati, Selma and Mobile R. R.: Selma to Akron, Ala	71.00	.....	2.00	73.00
60	Cincinnati, Van Wert and Michigan Common Carrier Co.: Shawes Crossing to Paulding	32.00	.....	1.00	33.00
61	Cincinnati, Wabash and Michigan R. R.: Anderson, Ind., to Benton Harbor, Mich	165.00	.....	.....	165.00
62	Clarksburg, Weston and Glenville R. R.: Weston to Clarksburg, W. Va	26.00	.....	1.00	27.00
63	Cleveland, Columbus, Cincinnati and Indianapolis R. R.:				
	a. Cleveland to Columbus, Ohio	138.00	18.00	72.00	557.00
	b. Deleware to Springfield, Ohio	50.00	.....	9.00	
	c. Galion, Ohio, to Indianapolis, Ind	203.00	2.00	45.00	
64	Cleveland, Mount Vernon and Delaware R. R.: Hudson to Columbus, Ohio	143.90	.....	13.50	157.40
65	Cleveland, Tuscarawas Valley and Wheeling R. R.: Lorain to Bridgeport, Ohio	157.50	.....	40.00	197.50
66	Cleveland, Youngstown & Pittsburg R. R.: Phalanx to Alliance, Ohio	23.00	.....	8.00	31.00
67	Clinton and Port Hudson R. R.: Clinton to Port Hudson, La	22.00	.....	2.00	24.00
68	Clove Branch Railroad: Clove Branch Junction to Clove Valley, N. Y	8.26	.....	1.50	9.76
69	College Hill Railroad: Cincinnati to Mount Healthy, Ohio	6.00	.....	1.00	7.00
70	Columbia and Greenville R. R.:				
	a. Columbia to Greenville, S. C	142.50	.....	.....	240.40
	b. Alston to Spartanburg, S. C	68.00	.....	.....	
	c. Helena to Laurens, S. C	29.90	.....	.....	
71	Columbus, Chicago, and Indiana Central R. R.:				
	a. Columbus, Ohio, to Indianapolis, Ind	188.00	.....	29.02	455.13
	b. Bradford, Ohio, to Logansport, Ind	114.20	.....	10.60	
	c. Richmond to Anoka Junction, Ind	107.60	.....	5.71	
72	Columbus, Hocking Valley and Toledo Railway:				
	a. Toledo Div.: Columbus to Toledo, Ohio	117.77	.....	19.97	226.52
	b. Ohio River Div.: Logan to Pomeroy, Ohio	81.91	.....	6.87	
73	Concord Railroad:				
	a. Concord R. R.: Concord to Nashua, N. H	.....	35.00	29.50	248.00
	b. M. and L. R. R.: Manchester, N. H., to Lawrence, Mass	26.00	.....	8.00	
	c. M. and No. W. R. R.: Manchester to North Weare, N. H	19.00	.....	1.50	
	d. Suncook Val. R. R.: Suncook to Portsmouth, N. H	18.00	.....	1.00	
	e. Concord and Portsmouth R. R.: Manchester to Portsmouth, N. H	41.00	.....	7.00	
	f. Nashua, Acton and Boston R. R.: Nashua, N. H., to North Acton, Mass	20.00	.....	2.50	
	g. Suncook Branch: Concord to Hooksett, N. H	8.00	.....	0.50	

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single Track.	Double Track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
74	Connecticut River R. R.: Springfield, Mass., to South Vernon, Vt.	50.00	17.00	24.00	108.00
75	Connotton Valley R. R.: Cleveland to Sherrodsville, Ohio	105.40	.....	17.32	122.72
76	Connecticut and Passumpsic R. R.: White River Junction to Canada line	110.00	.....	8.00	118.00
77	Cumberland and Maurice River R. R.: Bridgeton to Port Norris, N. J	21.50	.....	2.00	23.50
78	Cumberland and Pennsylvania R. R.:				
	a. Cumberland to Piedmont	33.00	.....	9.00	
	b. Eckhart Junction to Hoffman	10.00	.....	8.00	55.00
	c. Cumberland and Pennsylvania Junction to State line	3.00	.....	.....	
79	Cumberland Valley R. R.:				
	a. Main Line: Harrisburg, Pa., to Potomac River	82.20	6.20	18.00	
	b. Martinsburg and Potomac R. R.: Potomac River to Martinsburg, W. Va.	11.80	.....	0.68	
	c. Southern Pa. R. R.: South Pennsylvania Junction to Richmond, Pa	23.30	.....	1.26	152.64
	d. Dillsburg and Mechanicsburg R. R.: Dillsburg to Mechanicsburg, Pa	7.70	.....	0.30	
80	Danbury and Norwalk R. R.: Danbury to Wilson Point, Conn	28.00	.....	7.00	35.00
81	Dayton and Michigan R. R.:				
	a. Dayton to Toledo	142.00	.....	37.50	188.50
	b. McComb Br.: Deshler to McComb, Ohio	9.00	.....	.....	
82	Delaware R. R.; Newcastle, Frenchtown Junction, to Delman, Del	83.83	.....	15.54	99.37
83	Delaware and Hudson Canal: Northern R. R. Dep.:				
	a. Susquehanna Div.: Albany to Binghamton, N. Y	187.22	49.21	46.35	
	b. Saratoga Div.: Albany and Troy to Whitehall, N. Y., and Rutland Vt	192.59	20.36	24.75	
	c. Champlain Div.: Whitehall to Rouse's Point, N. Y	149.94	.....	19.19	968.55
	d. Nineveh to Jefferson Junction, Pa	22.01	.....	4.94	
	e. Carbondale to Scranton, Pa	13.87	2.23	18.13	
	f. Green Ridge to Mill Creek, Pa	11.19	5.69	7.38	
	g. South Wilkes Barre to Plymouth Junction, Pa	1.95	.....	0.90	
	h. Olyphant to Honesdale, Pa.[1]	26.31	.....	25.73	
	i. Honesdale to Olyphant, Pa.[1]	29.92	.....		
84	Delaware, Lackawanna and Western R. R. (Syracuse Div.): Oswego to Syracuse, N. Y	34.98	.....	19.16	54.14
85	Denver and Rio Grande Railway:				
	a. Denver to Pueblo, Colo[2]	119.60	.....	27.00	
	b. Colorado Springs to Manitou, Colo	5.30	.....	5.00	
	c. Pueblo to Silverton, Colo	375.00	.....	28.90	
	d. Cuchava to El Moro, Colo	43.80	.....	4.40	
	e. Placer to Iron Mine, Colo	2.10	.....	0.60	
	f. Alamosa to South Fork, Colo	46.20	.....	1.80	
	g. Antonito to Espanola	91.70	.....	5.90	
	h. Pueblo to Frisco, Colo	182.80	.....	23.40	1,297.80
	i. Cañon to West Cliff	31.50	.....	1.60	
	j. Florence to Chandler Creek Junction, Colo	5.10	.....	1.10	
	k. Hecla to Calumet, Colo	6.80	.....	8.00	
	l. Malta to Red Cliff, Colo	80.40	.....	3.20	
	m. Salida to Delta, Colo	159.10	.....	16.30	
	n. Gunnison to Crested Butte, Colo	27.90	.....	2.00	
	o. Poncha to Maysville, Colo	6.90	.....	5.00	
	p. Mears to Iron Mine, Colo	27.60	.....	1.80	
86	Des Moines and Fort Dodge R. R.: Des Moines to Ruthven, Iowa	137.50	.....	19.37	156.87
87	Detroit, Grand Haven and Milwaukee R. R.: Detroit to Grand Haven, Mich	189.00	.....	50.00	239.00
88	Detroit, Hillsdale and Southwestern R. R.: Ypsilanti to Bankers', Mich	64.80	.....	.....	64.80
89	Detroit, Lansing and Northern R. R.:				
	a. Detroit to Howard City, Mich	160.00	.....	23.00	276.00
	b. Ionia to Big Rapids, Mich	63.00	.....	30.00	
90	Detroit, Mackinac and Marquette R. R.: Saint Ignace to Marquette, Mich	152.00	.....	18.00	170.00

[1] Gravity road

[2] A third rail between Denver and Pueblo, equal to 179.4 miles of single track. This system is mostly of narrow gauge.

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
91	Dubuque and Dakota R. R.: Sumner to Hampton, Iowa.	63.20	.....	3.00	66.20
92	Dunkirk, Allegheny Valley and Pittsburgh R. R.: Dunkirk, N. Y., to Titusville, Pa	90.60	.....	15.00	105.60
93	East Broad Top Railroad[1]: Mount Union to Robertsdale, Pa	30.00	.....	.....	30.00
94	Eastern Railroad:				
	a. Boston, Mass., to Portland, Me	74.43	33.86		
	b. Conway Junction to North Conway, N. H	71.37	.....	90.60	411.94
	c. Various branches	99.78	4.02		
95	Eastern Kentucky Railway: Riverton, to Willard, Ky.	34.15	.....	6.34	40.49
96	Eastern Shore Railroad: Delman, Del., to Crisfield, Md.	38.00	.....	2.00	40.00
97	East Tennessee, Virginia and Georgia R. R.:				
	a. Bristol to Chattanooga, Tenn	242.00	.....	28.50	
	b. Morristown, Tenn., to North Carolina State line.	45.00	.....	1.25	
	c. Knoxville, Tenn., to Kentucky State line	67.00	.....	6.00	
	d. Cleveland, Tenn., to Lauderdale, Miss	359.00	.....	27.50	1,151.75
	e. Rome to Atlanta, Ga	72.00	.....	.....	
	f. Atlanta to Macon, Ga	88.00	.....	.....	
	g. Macon to Brunswick, Ga	200.00	.....	15.50	
98	Edgewood Railroad: Pennsylvania R. R. to Hampton Coal Mine, Pennsylvania	1.00	.....	0.33	1.33
99	Elberton Air Line R. R. and Hartwell R. R.:				
	a. Toccoa to Elberton, Ga	50.00	.....	0.75	61.00
	b. Bowersville to Hartwell, Ga	10.00	.....	0.25	
100	Elizabeth City & Norfolk R. R.:				
	a. Norfolk, Va., to Edenton, N. C	73.00	.....	4.00	78.00
	b. Elizabeth City Junction to Elizabeth City wharf, Va	1.00	.....	.....	
101	Elizabethtown, Lexington and Big Sandy R. R: Lexington, Ky., to Huntington, W. Va	109.14	.....	12.90	122.04
102	Evansville and Terre Haute R. R.:				
	a. Main line, Evansville to Terre Haute, Ind	109.00	.....	26.00	178.70
	b. Mount Vernon Branch, Fort Branch to Mount Vernon, Ind	37.70	.....	6.00	
103	Fitchburg Railroad:				
	a. Boston to Greenfield, Mass	30.26	78.54	95.62	325.60
	b. South Acton to Marlborough, Mass	12.42	.....	.....	
	c. Brick Yard to Waltham, Mass	6.60	.....	.....	
	d. Ayer to Greenville, Mass	23.62	.....	.....	
104	Flint and Pere Marquette R. R.:				
	a. Monroe to Ludington, Mich	253.34	.....	81.55	
	b. Flint to Fostoria, Mich	19.51	.....	1.65	
	c. East Saginaw to Bay City, Mich	12.85	.....	8.32	
	d. Harrison Junction to Harrison, Mich[2]	15.50	.....	23.69	474.88
	e. Manistee Junction to Manistee, Mich	26.53	.....	8.09	
	f. Coleman to Mount Pleasant, Mich[2]	15.02	.....	0.97	
	g. Saginaw City Junction to South Saginaw, Mich	4.65	.....	3.21	
105	Fond du Lac, Amboy and Peoria Railway: Fond du Lac to Iron Ridge Junction, Wisconsin	30.00	.....	1.50	31.50
106	Fort Wayne, Cincinnati and Louisville R. R.: Fort Wayne, Ind., to Cincinnati, Ohio	104.00	.....	5.00	109.00
107	Geneva, Ithaca and Sayre, and Penna. and N. Y. Canal and R. R.:				
	a. Geneva, Ithaca and Sayre R. R.: State line to Geneva, N. Y	74.99	.....	17.43	
	Cayuga branch, Ithaca to Cayuga, N. Y	38.36	.....	5.97	415.58
	b. Penna. and N. Y. Canal and R. R., State line to S. B. Junction, Pennsylvania	94.70	51.90	97.09	
	Various short lines, Pennsylvania	13.24	.....	.....	
108	Grand Rapids and Indiana R. R.:				
	a. Fort Wayne, Ind., to Mackinaw, Mich	366.00	.....	60.00	519.00
	b. Fort Wayne, to Richmond, Ind	86.00	.....	7.00	
109	Grand Trunk Railway of Canada:[3] Portland, Me., and Point Levi, Quebec, to Detroit, Buffalo, and Goderich, and branches	1,466.50	7.50	248.00	1,722.00
110	Green Lick Narrow Gauge Railway: Green Lick Junction to Mount Vernon Ore Mines, Pennsylvania	3.56	.....	0.43	3.99
111	Greenwich and Johnsonville Railway: Greenwich, N. Y., to Johnsonville, N. Y	14.65	.....	1.00	15.65

[1] Gauge 3 feet.

[2] Gauge, 3 feet; the other portions, 4 feet 8½ inches.

[3] Part of this road lies within the United States, but as the extent of this portion is not stated, the whole is here entered, as tending to present the results of experience in railway ties.

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
112	Hannibal and Saint Joseph R. R.:				
	a. Hannibal, Mo., to Saint Joseph, Mo	266.41	.....	37.50	345.73
	b. Saint Joseph to Atchison, Kans	19.47	.....	4.78	
	c. Cameron Junction, to Kansas City, Mo.	53.05	.....	9.41	
	d. Palmyra, Mo., to Quincy, Ill	13.42	.....	1.69	
113	Hartford and Connecticut Western R. R:				
	a. Hartford to State line, Connecticut	68.75	.....	15.00	123.25
	b. Boston Corner to Rhinebeck, N. Y	36.50	.....	3.00	
114	Houston and Texas Central Railway:				
	a. Houston to Denison, Tex	338.00	.....	42.50	818.40
	b. Hempstead to Austin, Tex	114.50	.....	3.70	
	c. Garrett to Waxahachie, Tex	12.00	.....	3.00	
	d. Garrett to Terrell, Tex	65.80	.....	0.80	
	e. Bremond to Albany, Tex	230.60	.....	7.50	
115	Houston, East and West Texas R. R.: Houston to Lewis' Switch, Tex	140.00	.....	.....	140.00
116	Illinois Central R. R.:	.....	.....	.....	
	a. Chicago to Cairo, Ill	.....	.....	.....	
	b. Branch Junction, Ill., to Dubuque, Iowa	.....	.....	.....	
	c. Dubuque to Sioux City, Iowa	.....	.....	.....	
	d. C. F. and M. Junction to Mona, Iowa	.....	.....	.....	
	e. Gilman to Springfield	.....	.....	.....	
	f. Otto to Kankakee Junction, Ill	.....	.....	.....	
	g. Kempton Junction to Colfax	.....	.....	.....	
117	Illinois Midland Railway:				
	a. Farrington to Decatur Junction, Ill	95.00	.....	5.00	170.00
	b. Maros to Farmdale, Ill	67.00	.....	3.00	
118	International and Great Northern R. R.:				
	a. Palestine to Laredo, Tex	418.30	.....	.....	773.00
	b. Round Rock to Georgetown: Georgetown R. R	10.00	.....	.....	
	c. Palestine to Columbia, Tex	200.70	.....	.....	
	d. Phelps to Huntsville, Tex	8.00	.....	.....	
	e. Palestine to Longview, Tex	81.30	.....	.....	
	f. Troupe to Mineola, Tex	44.40	.....	.....	
	g. Overton to Henderson, Tex	16.00	.....	.....	
119	Iowa Eastern R. R.: Beulah to Elkander, Iowa	14.40	.....	0.50	14.90
120	Iron R. R. (now consolidated with Toledo, Cincinnati and Saint Louis R. R.): Ironton to Centre Station, Ohio	13.00	.....	9.00	22.00
121	Ithaca, Auburn and Western Railway: Freeville to Auburn, N. Y	37.70	.....	2.00	39.70
122	Jefferson, Madison and Indianapolis R. R.:				
	a. Louisville, Ky., to Indianapolis, Ind	110.00	.....	25.40	265.34
	b. Columbus to Cambridge City, Ind	63.04	.....	4.58	
	c. Columbus to Madison, Ind	44.90	.....	9.20	
	d. Jeffersonville to New Albany, Ind	6.01	.....	2.21	
123	Junction R. R.: Gray's Ferry to Market Street, and Thirty-fourth street to Belmont, Pa	.....	4.60	1.50	10.70
124	Kansas City, Fort Scott and Gulf R. R:				
	a. Kansas City to Webb City, Mo	182.00	.....	48.00	563.00
	b. Fort Scott Junction, Kans., to West Plains, Mo.	213.00	.....	11.00	
	c. Weir City to Cherryvale, Kans	50.00	.....	4.00	
	d. Arcadia to Cherokee, Kans	20.00	.....	4.00	
	e. Rich Hill Junction, Kans., to Carbon Centre, Mo.	24.00	.....	7.00	
125	Kansas City, Lawrence and Southern Kansas R. R.:				
	a. Wassea Junction to Harper, Kans	291.53	.....	17.73	422.97
	b. Lawrence to Lawrence Junction, Kans	26.03	.....	1.43	
	c. Burlington Junction to Burlington, Kans	42.20	.....	2.00	
	d. Cherryvale to Coffeyville, Kans	18.20	.....	1.60	
	e. Wellington to Hunniwell, Kans	18.40	.....	1.34	
	f. U. P. connections at Lawrence, &c	2.51	.....	.....	
126	Kansas City, Saint Joseph and Council Bluffs R. R.:				
	a. Kansas City, Mo., to Council Bluffs, Iowa	197.90	.....	38.03	355.19
	b. Amazonia to Hopkins, Mo	50.24	.....	3.95	
	c. Biglow, Mo., to Burlington Junction, Iowa	81.53	.....	1.88	
	d. Corning to Northboro', Mo	30.06	.....	1.60	
127	Kendall and Eldred R. R.: Bradford to Eldred, Pa	19.00	.....	2.00	21.00
128	Kentucky Central Railway:				
	a. Covington to Lexington, Ky	100.00	.....	13.00	164.88
	b. Paris to Maysville, Ky	50.00	.....	1.88	
129	Knox and Lincoln R. R.: Bath to Rockland, Me	48.00	.....	4.00	52.00
130	Knoxville and Augusta R. R.: Knoxville to Marysville, Tenn	16.00	.....	5.00	21.00
131	Lake Erie and Western Railway:				
	a. Sandusky, Ohio, to Bloomington, Ill	375.80	.....	46.09	432.00
	b. Saint Mary's to Minster, Ohio	10.11	.....	.....	

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
132	Lake Shore and Michigan Southern R. R.: Buffalo, N. Y., to Chicago, Ill. (with branches)	*Miles.* 1,176.82	*Miles.* 266.24	*Miles.* 503.60	*Miles.* 2,212.90
133	Lehigh Valley R. R.:				
	a. Perth Amboy, N. J., to Wilkes Barre, Pa.	39.16	121.84	167.92	
	b. Landsdown to Clinton	2.05	.....	0.59	
	c. Slatington to Slatedale, Pa	8.30	.....	0.67	
	d. Bear Creek Junction to Bear Creek, Pa	12.08	.....	1.49	
	e. Penn Haven Junction to Audenried, Pa	6.05	10.59	18.73	741.59
	f. Black Creek Junction to Mount Carmel and Ashland, Pa	35.52	30.26	28.48	
	g. High Creek Bridge to Tomhicken and Milnesville, Pa	41.14	10.26	38.51	
134	*Little River Valley and Arkansas R. R.: New Madrid to Malden, Ark	28.00	.....	1.00	29.00
135	Longview and Saline Valley R. R.: Longview Junction to Walround's Mill	11.00	.....	0.50	11.50
136	Louisville, Evansville and Saint Louis R. R.:				
	a. New Albany, Ind., to Mount Vernon, Ill.	182.40	.....	11.60	
	b. Evansville to Jasper, Ind	55.00	.....	4.70	270.10
	c. Rockport to Junction, Ind	16.00	.....	0.40	
137	Louisville and Nashville R. R.:				
	a. Cincinnati, Ohio, to New Orleans, La	1,416.90	.....	192.00	
	b. Saint Louis, Mo., to Nashville, Tenn.	843.20	.....	42.10	2,273.40
	c. Memphis, Tenn., to Junction, Ky.	259.10	.....	20.10	
138	Louisville, New Albany and Chicago Railway: New Albany to Michigan City, Ind.	288.30	.....	41.30	329.60
139	Maine Central R. R.:				
	a. Portland to Vanceboro', Me	250.70	5.00		
	b. Cumberland Junction to Skowhegan, Me.	90.70	.....		
	c. Bath to Farmington, Me	71.20	.....	75.23	549.63
	d. Crowley's Junction to Lewiston, Me.	4.70	.....		
	e. Burnham Junction to Belfast, Me	33.10	.....		
	f. Newport Junction to Dexter, Me	14.00	.....		
140	Manhattan Railway, New York City: Elevated Rwy. and connections	64.00	32.00	15.00	143.00
141	Manchester and Lawrence R. R.: Manchester, N. H., to Lawrence, Mass.	26.00	.....	.....	26.00
142	Marquette, Houghton and Ontonagon R. R.: Marquette to L'Anse, Mich	90.50	.....	23.50	114.00
143	Mobile and Northwestern R. R.: Glendale to Clarksdale, Miss	30.00	.....	1.00	31.00
144	Memphis and Vicksburg and Mississippi Valley and Ship Island R. R.:				
	a. Memphis, Tenn., to Vicksburg, Miss.	215.00	.....	.....	450.00
	b. Vicksburg, Miss., to New Orleans, La	235.00			
145	Midland North Carolina R. R.: Morehead City to Smithfield, N. C	117.00	.....	10.00	127.00
146	Milwaukee, Lake Shore and Western Rwy.:				
	a. Milwaukee to Rhinelander, Wis.	255.00	.....	24.00	
	b. Manitowoc to Two Rivers, Wis.	6.00	.....	1.00	340.00
	c. Hortonville to Oshkosh, Wis.	22.50	.....	3.00	
	d. Eland Junction to Wausau, Wis.	23.50	.....	6.00	
147	Mineral Range R. R.: Hancock to Calumet, Mich	12.50	.....	1.80	14.30
148	Minneapolis and Saint Louis R. R.:				
	a. Minneapolis, Minn., to Angus, Iowa	250.00	.....	85.00	450.00
	b. Hopkins to Morton, Minn.	101.00	.....	5.00	
149	Missouri Pacific Railway:				
	a. Saint Louis, Mo., to Atchison, Kans	330.00	.....	.....	
	b. Kirkwood to Carondelet, Mo	11.00	.....	.....	
	c. Booneville to Versailles, Mo	44.00	.....	.....	
	d. Sedalia to Lexington, Mo.	55.00	.....	.....	
	e. Holden, Mo., to Leroy Junction, Kans	115.00	.....	.....	
	f. Osawatomi to Ottawa, Kans	20.00	.....	.....	
	g. Pleasant Hill to Carthage, Mo	115.00	.....	.....	
	h. Independence to Lexington, Mo	32.00	.....	.....	1,408.00
	i. Laclede to Crevecoeur Lake, Mo.	12.00	.....	.....	
	j. Jefferson City to Cooper, Mo.	40.00	.....	.....	
	k. Atchison, Kans., to Saint Joseph, Mo	21.00	.....	.....	
	l. Sedalia to Warsaw, Mo	42.00	.....	.....	
	m. Atchison, Kans., to Omaha, Nebr	166.00	.....	.....	
	n. Carthage to Joplin, Mo	17.00	.....	.....	
	o. Atchison to Lenora, Kans. (and branches)	388.00	.....	.....	
150	Mobile and Spring Hill R. R.: Mobile to Spring Hill, Ala.	8.00	.....	2.00	10.00

*Now a part of the Texas and Saint Louis R. R., gauge 3 feet.

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
151	Morgan's Louisiana and Texas R. R.:				
	a. New Orleans to Cheneyville, La	204.00	.....	45.00	
	b. Terrebonne Station to Houma, La	15.00	.....	1.50	
	c. Terrebone Station to Thibodeaux, La	5.00	.....	0.50	281.00
	d. Cade Switch to Saint Martinsville, La	6.75	.....	0.50	
	e. Raceland Station to Bayou La Fourche, La	2.50	.....	0.25	
152	Pittsburgh, Cincinnati and Saint Louis Railway, Muskingum Valley Division: Dresden Junction to Morrowtown, Ohio	148.00	.....	13.73	161.73
153	Narragansett Pier R. R.: Kingston to Narragansett Pier, R. I	8.50	.....	0.70	9.20
154	Nashville, Chattanooga and Saint Louis Railway:				
	a. Chattanooga, Tenn., to Hickman, Ky	321.00	.....	43.00	
	b. Nashville to Lebanon, Tenn	30.00	.....		
	c. Tullahoma to Rock Island, Tenn	48.00	.....	4.33	515.33
	d. Decherd to Fayetteville, Tenn	40.00	.....		
	e. Jasper to Victoria, Tenn	19.00	.....	2.50	
	f. Wartrace to Shelbyville, Tenn	8.00	.....	.....	
155	Natchez, Jackson, and Columbus R. R.: Natchez to Martin, Miss	43.00	.....	1.00	44.00
156	Naugatuck Railroad: Bridgeport to Winsted, Conn	62.00	.....	5.00	67.00
157	Nevada Central Railway: Battle Mountain to Austin, Nev	93.00	.....	40.00	133.00
158	Newark, Somerset, and Straitsville R. R.: Newark to Shawnee, Ohio	44.00	.....	5.63	49.63
159	Newburgh, Dutchess, and Connecticut R. R.: Dutchess Junction to Millerton, N. Y	.....	.....	.....	.....
160	New Brighton and New Castle R. R.: New Brighton to Wampum, Pa	12.50	.....	.....	12.50
161	New Haven and Northampton R. R.:				
	a New Haven to Conway Junction, Mass	94.70	.....	19.60	
	b. Farmington to New Hartford, Conn	14.10	.....	1.40	
	c. Westfield to Holyoke, Mass	19.30	.....	4.10	164.10
	d. Northampton to Williamsburgh, Mass	7.50	.....	1.40	
	e. South Deerfield to Turner's Falls., Mass	10.00	.....	1.00	
162	New London Northern R. R.: New London, Conn., to Brattleboro', Vt	121.00	.....	30.00	151.00
163	Newport and Richford R. R.: Newport to Richford, Vt.	21.75	.....	3.42	25.17
164	New York and Greenwood Lake R. R.:				
	a. Jersey City to State Line, N. J	44.00	.....	5.00	
	b. Woodside Park to Orange, N. J	4.00	.....	0.50	56.41
	c. Ringwood Junction to Ringwood, N. J	2.75	.....	0.16	
165	New York Central and Hudson River R. R.:				
	a. N. Y. to East Albany: main line	.....	144.00	70.13	
	b. Albany to Buffalo, main line; distance 297.75 miles; 297.75 miles of second track; 294.92 miles of third track; 294.92 miles of fourth track; 416.81 miles of turnouts. Total miles of track	1,602.15			
	c. Branches	306.99	32.12	.....	2,676.79
	Leased lines:				
	d. Troy to Greenbush	.....	6.00	.....	
	e. Niagara Bridge to Canandaigua	98.46	.....	5.50	
	f. Spuyten Duyvil and Port Morris	.....	6.04	.....	
	g. New York and Harlem R. R	126.96	22.44	38.31	
	h. Branches	7.09	.....	.....	
166	New York and New England R. R.:				
	a. Boston, Mass., to Fishkill-on-the-Hudson, N.Y	227.80	30.94	69.58	
	b. Brookline, Mass., to Woonsocket, R. I	83.75	.....	6.37	
	c. Islington to Dedham, Mass	2.00	.....	0.09	
	d. East Thompson, Conn., to Southbridge, Mass	17.50	.....	2.21	
	e. Franklin to Valley Falls, Conn	13.60	.....	.....	620.13
	f. Willimantic, Conn., to Providence, R. I	58.50	.....	10.47	
	g. Norwich, Conn., to Worcester, Mass	58.90	.....	13.90	
	h. Vernon to Rockville, Conn	4.40	.....	.....	
	i. East Hartford, Conn., to Springfield, Mass	29.20	.....	2.68	
	j. Melrose to West St., Rockville, Conn	7.30	.....	.....	
167	New York, New Haven and Hartford, R. R.:				
	a. New York City, N. Y., to Springfield, Mass	.....	136.00	.....	
	b. New Haven to New London, Conn	50.00	.....	.....	
	c. New Rochelle, to Harlem River, N. Y.	12.50	.....	.....	352.50
	d. Berlin to Middletown, Conn	10.00	.....	.....	
	e. Belvin to New Britain, Conn	3.00	.....	.....	
	f. Windsor Lock to Suffield, Conn	5.00	.....	.....	
168	New York City and Northern R. R.:				
	a. One hundred and Fifty-fifth street and Eighth avenue, New York City to High Bridge	.....	1.16	4.00	66.59
	b. High Bridge to Brewsters', N. Y	52.90	.....	7.37	

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
169	New York, Lake Erie and Western R. R.*:				
	a. Jersey City, N. J., to Dunkirk, N. Y	460.00	331.00	285.00	2,411.00
	b. Branches owned and leased	568.00	107.00	232.00	
170	New York, Pennsylvania and Ohio R. R.:				
	a. Salamanca, N. Y., to Dayton, Ohio	387.90		133.60	762.89
	b. Cleveland, Ohio, to Sharon, Pa	94.91		62.50	
	c. Sharon to Sharon Junction, Pa				
	d. Sharon to Middlesex, Pa				
	e. Franklin Junction to Oil City, Pa	33.75		7.60	
	f. Niles to New Lisbon, Ohio	36.05		6.08	
171	New York, Susquehanna and Western R. R.: Jersey City N. J. to Middletown, N. Y	87.70		11.50	99.20
172	New York, Providence and Boston R. R.:				
	a. Groton, Conn., to Providence, R. I	12.00	50.00	11.00	146.98
	b. Auburn Station to Hope, R. I	10.36			
	c. Auburn Station to Oakland Beach and Buttonwood	9.87		0.50	
	d. Auburn Station to Harbor Junction	2.75		0.50	
173	Norfolk and Western R. R.: Norfolk, Va., to Bristol, Tenn., including City Point and Saltville branches, each 10 miles long	428.00		42.70	470.70
174	Northern Central Railway:				
	a. Main line, Baltimore division: Baltimore, Md., to Marysville, Pa	35.03	56.48	60.32	218.01
	b. Green Spring Branch: Hollin's Station to Green Spring Junction	8.59		1.11	
175	Northern Pacific Railroad†:				
	a. Sunk Rapids to Brainerd, Minn	60.00		6.00	816.00
	b. Duluth, Minn., to Glendive, Mont	668.00	1.00	80.00	
176	North Pacific Coast Railroad: Saucelito to Duncan's Mills, Cal	74.25		9.00	83.25
177	Ogdensburgh and Lake Champlain R. R.: Ogdensburgh to Rouse's Point, N. Y	118.00		27.00	145.00
178	Ohio and Mississippi Railway:				
	a. Cincinnati, Ohio, to Saint Louis, Mo	339.00		108.00	720.00
	b. North Vernon, Ind., to Louisville, Ky	53.00			
	c. Bland Station to Shawneetown, Ill	225.00			
179	Oil City and Ridgeway Railway and Mining Co.: Cranberry Mines to South Oil City, Pa	5.50			5.50
180	Old Colony Railroad: Boston to Newport, R. I., Provincetown, Plymouth, and branches	305.00	23.00		351.00
181	Olean, Bradford and Warren Railway: Bradford, Pa., to Olean, N. Y	23.00		3.00	26.00
182	Oregon and California R. R.:				
	a. Portland to Myrtle Creek, Oreg	220.00		17.80	354.20
	b. Portland to Corvalis, Oreg	97.00		7.90	
	c. Albany to Lebanon, Oreg	11.50		0.90	
183	Painesville and Youngstown R. R.: Painesville to Youngstown, Ohio	62.00		5.00	67.00
184	Pennsylvania Railroad: Jersey City to Pittsburgh; main line‡		445.18	449.11	1,839.47
185	Pennsylvania R. R., Ashtabula and Pittsburgh R. R.: Ashtabula Harbor to Youngstown, Ohio	63.00		10.00	73.00
186	Pennsylvania R. R.: Alliance Junction to Niles, Ohio	24.90		1.75	26.65
187	Pennsylvania R. R., Pittsburgh, Fort Wayne and Chicago R. R.: Pittsburgh, Pa., to Crestline, Ohio	189.00	56.00	79.80	330.80
188	Pennsylvania R. R., Cleveland and Pittsburgh R. R.:				
	a. Cleveland to Wellsville, Ohio	100.00		54.10	292.30
	b. Bellaire to Rochester, Pa	60.00		33.10	
	c. Bayard to New Philadelphia, Ohio	32.00		4.10	
189	People's Railway: Pottsville to Minersville, Pa	4.00			4.00
190	Peoria, Decatur and Evansville Railway: Peoria, Ill., to Evansville, Ind	248.00		27.00	275.00
191	Perkiomen R. R.: Perkiomen Junction to Emaus Junction, Pa	38.50		8.70	47.20
192	Pennsylvania Coal Co.: Point Griffith to Hawley, Pa		47.00	25.00	119.00
193	Pennsylvania and New York Canal and R. R.:				
	a. State Line to G. and B. Junction, Pa	94.70	51.90	67.09	278.83
	b. Five short lines and connecting branches, Pa	13.24			

* Broad gauge (6 feet). Upon 333 miles of single track, 106 miles of double track, and 27 miles of sidings, there is a third rail, thus admitting of cars with common 4 feet 8½-inch gauge.

† Branch lines and road constructed in 1882 and 1883 not included. Since completed through to the Pacific.

‡ No report from branch lines, except Nos. 178, 179, 180, and 181, which are operated by the Pennsylvania R. R.

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
194	Petersburg and Weldon R. R.: Petersburg, Va., to Washington, N. C	60.00	.....	6.00	66.00
195	Philadelphia and Reading R. R.:				
	Roads owned:				
	a. Main line; Philadelphia to Reading, Pa	.....	98.40	156.20	
	b. Northern Liberties and Penn Township branch	.....	1.40	2.19	
	c. Port Kennedy branch	1.20	.....	0.10	
	d. Lebanon Valley branch	9.20	44.50	25.90	
	e. Lebanon and Tremont branch	42.20	.....	25.50	782.70
	f. Schuylkill and Susquehanna branch	53.40	.....	9.00	
	g. Mount Carbon branch	8.50	.....	9.50	
	h. Mahony and Shamokin branch	53.80	10.80	70.70	
	i. Moselm branch	1.70	.....	0.70	
	k. West Reading branch	1.90	.....	0.90	
	Roads leased:				
	a. Chester Valley R. R.: Bridgeport to Downingtown	21.50	.....	1.80	
	b. Colebrookdale R. R.: Pittstown to Barto	12.80	.....	2.30	
	c. Pickering Valley R. R.: Phoenixville to Byers	11.00	.....	1.00	
	d. East Pennsylvania R. R.: Reading to Allentown	17.70	18.30	16.70	
	e. Allentown R. R.: Topton to Kutztown	4.50	.....	0.40	
	f. Little Schuylkill R. R.: Port Clinton to Tamaqua	28.10	.....	25.20	
	g. Mine Hill R. R.: Schuylkill Haven to Locust Gap	31.30	21.30	58.50	
	h. Mount Carbon and Port Carbon R. R.: Mount Carbon to Palo Alto	.....	2.50	13.40	
	i. Mill Creek R. R.: Palo Alto to New Castle	.....	3.80	17.60	
	j. Schuylkill Valley R. R.: Palo Alto to Tuscarora	5.70	5.30	11.20	858.90
	k. East Mahony R. R.: East Mahony Junction to Mahony City	10.70	.....	4.60	
	l. Philadelphia, Germantown and Norristown R. R.: Philadelphia to Germantown and Norristown	13.50	20.20	22.70	
	m. Catawissa R. R.: Tamanend to Williamsport	93.00	.....	27.70	
	n. Philadelphia and Chester branch: Philadelphia to Chester	9.20	4.90	3.10	
	o. North Pennsylvania R. R.	39.50	46.90	38.60	
	p. Delaware and Bound Brook R. R.	3.70	27.00	9.60	
	q. Norristown Junction R. R.	.....	0.40	0.10	
	Roads controlled:				
	a. Reading and Columbia R. R	39.50	.....	16.40	
	b. Lebanon branch R. and C. R. R	1.60	.....	.....	84.30
	c. Quarryville branch R. and C. R. R	15.30	.....	1.30	
	d. Northeastern Pennsylvania R. R	9.60	.....	0.60	
196	Philadelphia, Newtown & New York R. R.: Philadelphia to Newtown, Pa	20.90	.....	1.50	22.40
197	Philadelphia, Wilmington and Baltimore R. R.:				
	a. Philadelphia, Pa., to Baltimore, Md	.....	94.99	65.23	
	b. Newark to Delaware City, Del	11.79	.....	1.24	
	c. Philadelphia to West Chester, Pa	22.88	3.20	11.40	
	d. Lamokin to Junction, Pa	7.14	.....	2.94	
	e. Junction, Pa., to Fort Deposit, Md	45.71	.....	7.68	598.28
	f. Wilmington to Delmar, Del	95.99	.....	22.16	
	g. Townsend to Centreville, Md	35.01	.....	2.24	
	h. Clayton to Smyrna, Del	1.27	.....	0.22	
	i. Clayton, Del., to Oxford, Md	54.00	.....	3.00	
198	Port Huron and Northwestern R. R.:				
	a. Port Huron to East Saginaw, Mich	91.00	.....	2.00	
	b. Port Huron to Sand Beach, Mich	70.00	.....	1.50	236.50
	c. Port Huron to Almont, Mich	33.00	.....	3.25	
	d. Palms to Port Austin	35.00	.....	0.75	
199	Portland and Ogdensburgh R. R.:				
	a. Portland, Me., to Fabyan's, N. H	91.00	.....	15.00	108.25
	b. Scott's Mills, N. H., to Lunenberg, Vt	2.00	.....	0.25	
200	Portland and Rochester R. R.: Portland, Me., to Rochester, N. H	52.50	.....	6.00	58.50
201	Potomac, Fredericksburg and Piedmont R. R.: Fredericksburg to Orange, Va	38.00	.....	2.00	40.00
202	Poughkeepsie, Hartford and Boston R. R.: Poughkeepsie, N. Y., to State line	41.70	.....	3.20	44.90
203	Providence and Worcester R. R.:				
	a. Providence, R. I., to Worcester, Mass	1.50	41.90	30.00	
	b. Valley Falls to East Providence, R. I	7.00	.....	2.50	141.18
	c. Bellingham to Milford, Mass	3.88	.....	0.50	
	d. Milford to Ashland, Mass	11.50	.....	0.50	

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
204	Providence, Warren and Bristol R. R.: East Providence to Bristol, R. I.	12.35	1.25	1.50	16.35
205	Raleigh and Augusta R. R.: Raleigh to Hamlet, N. C.	100.00	.....	5.00	105.00
206	Raleigh and Gaston R. R.: Raleigh to Weldon, N. C.	97.00	.....	11.25	108.25
207	Reading and Columbia R. R.:				
	a. Lancaster Junction to Lancaster, Pa.	8.00			
	b. Lancaster to Quarryville, Pa.	15.25	.....	14.38	77.63
	c. Columbia to Sinking Spring.	40.00			
208	Rhode Island and Massachusetts R. R., Massachusetts division: Franklin, Mass., to Valley Falls, R. I.	7.25	.....	.....	7.25
209	Richmond and Alleghany R. R.:				
	a. Richmond to Clifton Forge, Va.				
	b. Balcony Falls to Lexington, Va.	261.00	.....	20.00	281.00
	c. Lerraine to Hungary, Va.				
210	Richmond and Petersburg R. R.: Richmond to Petersburg, Va.	23.00	.....	4.50	27.50
211	Richmond, Fredericksburg and Potomac R. R.: Richmond to Quantico, Va.	81.70	.....	9.00	90.70
212	Rio Grande R. R.: Brownsville to Point Isabel, Tex.	22.50	.....	0.75	23.25
213	Roane Iron Company: Rockwood, Tenn., to Tennessee River.	5.50	.....	1.00	6.50
214	Rochester and Pittsburgh R. R.:				
	a. Rochester to Salamanca, N. Y.	108.00	2.00	13.00	153.50
	b. Salamanca Junction, N. Y., to Bradford, Pa.	20.00	0.75	2.00	
215	Rock Island and Peoria Railway: Rock Island to Peoria, Ill.	91.00	.....	6.75	97.75
216	Roswell R. R.: Roswell Junction to Roswell, Ga.	10.00	.....	0.50	10.50
217	Rumford Falls and Buckfield R. R.: Canton to Mechanic Falls, Me.	29.00	.....	1.50	30.50
218	Saint John and Lake Eustis R. R.: Atlas to Fort Mason, Fla.	26.00	.....	0.50	26.50
219	Saint Johnsbury and Lake Champlain R. R.: Swanton to Lunenberg, Vt.	120.00	.....	5.00	125.00
220	Saint Louis and Cairo R. R.: East Saint Louis to Cairo, Ill.	151.50	.....	16.25	167.75
221	Saint Louis, Salem and Little Rock R. R.:				
	a. Cuba to Salem, Mo.	41.00	.....	3.00	
	b. Sligo Junction to Sligo Furnace, Mo.	5.00	.....	.....	57.00
	c. Avery to Smith Bank, Mo.	4.00	.....	.....	
	d. Howe's to Paint Bank, Mo.	4.00	.....	.....	
222	Saint Louis, Vandalia and Terre Haute R. R.: Saint Louis, Mo., to Terre Haute, Ind.	165.00	.....	.....	165.00
223	Saint Paul and Duluth R. R.:				
	a. Saint Paul to Duluth, Minn.	155.00	.....	38.75	
	b. White Bear to Stillwater, Minn.	13.50	.....	2.00	
	c. White Bear to Minneapolis, Minn.	15.00	.....	1.00	255.25
	d. Wyoming to Taylor's Falls, Minn.	20.50	.....	2.00	
	e. N. P. Junction to Knife Falls, Minn.	6.50	.....	1.00	
224	Saundersville and Tennille R. R.: Saundersville to Tennille, Ga.	3.25	.....	0.20	3.45
225	Sandusky, Mansfield and Newark R. R.: Sandusky to Newark, Ohio.	116.25	.....	28.11	144.36
226	Sandy River R. R.: Phillips to Farmington, Me†	18.00	.....	2.00	20.00
227	San Francisco and North Pacific R. R.:				
	a. Donohue to Cloverdale, Cal.	56.00	.....	9.00	
	b. San Rafael to Petaluma, Cal.	21.00	.....	4.00	100.00
	c. Fulton to Guerneville, Cal.	16.00	.....	3.00	
228	Savannah, Florida and Western Railway:				
	a. Savannah to Bainbridge, Ga.	296.80	.....	25.50	
	b. Thomasville to Albany, Ga.	58.10	.....	1.70	
	c. Dupont, Ga., to Live Oak, Fla.	47.60	.....	2.60	457.70
	d. Waycross, Ga., to Jacksonville, Fla.	76.20	.....	4.70	
	e. Junction (near Savannah) to crossing Georgia Central R. R.	4.50	.....	.....	
229	Savannah, Griffin and North Alabama R. R.: Griffin to Carrolton, Ga.	60.00	.....	0.75	60.75
230	Seaboard and Roanoke R. R.: Portsmouth, Va., to Weldon, N. C.	78.56	.....	10.81	79.37
231	Shenandoah Valley R. R.: Hagerstown, Md., to Roanoke, Va.	248.50	.....	12.00	260.50
232	Shenango and Allegheny R. R.:				
	a. Greenville to Hilliard, Pa.	47.00	.....	10.00	61.00
	b. Coaltown Junction to Coaltown, Pa.	3.00	.....	1.00	

*Three-foot gauge.
†Two-foot gauge.

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
232	Shepaug R. R.: Hawleyville to Litchfield, Conn	32.25	.....	1.50	33.75
234	Ship Island, Ripley and Kentucky R. R.: Middletown, Tenn., to Ripley, Miss	25.00	.....	0.75	25.75
235	Silver Lake Railroad: Perry to Gainesville, N. Y	7.00	.....	1.00	8.00
236	Sioux City and Pacific Railroad:				
	a. Missouri Valley to Sioux City, Iowa	75.70	.....	10.30	442.10
	b. Missouri Valley, Iowa, to Thacher, Nebr	299.40	.....	12.80	
	c. Norfolk Junction to Creighton, Nebr	42.10	.....	1.80	
237	Skaneateles R. R.: Skaneateles Village to Skaneateles Junction, N. Y	5.00	.....	0.50	5.50
238	Somerset Railroad: West Waterville to North Anson, Me	25.00	.....	2.00	27.00
239	South Carolina Railway:				
	a. Charleston to Branchville, S. C	63.00	.....	12.00	275.80
	b Branchville, S. C., to Augusta, Ga	75.00	.....	8.20	
	c. Branchville to Columbia, S. C	68.00	.....	10.20	
	d. Kingsville to Camden, S. C	38.00	.....	1.80	
240	Southern Central Railroad: Fairhaven, N. Y., to Pennsylvania State line	114.00	.....	18.75	132.75
241	South Pacific Coast R. R.: San Francisco to Santa Cruz, Cal	77.00	7.00	21.00	102.00
242	Southern Pacific R. R., northern division:				
	a. San Francisco to Monterey, Cal	125.10	.....	25.00	222.80
	b. Carnadero to Tres Pinos, Cal	18.00	.....		
	c. Castroville to Soledad, Cal	33.20	.....		
	d. Pajava to Santa Cruz, Cal	21.50	.....		
243	Springfield, Effingham and Southeastern R. R.: Effingham, Ill., to Wabash River	57.00	.....	4.00	61.00
244	Springville and Sardinia R. R.: Springville to Sardinia, N. Y	12.00	.....	1.50	13.50
245	Stony Cove and Catskill Mountain R. R.:* Phœnicia to Hunter, N. Y	14.50	.....	0.50	14.00
246	Sullivan County R. R.: Bellows Falls to Windsor, Vt	26.00	.....	6.00	32.00
247	Sussex Railroad:				
	a. Main line, Waterloo to Franklin, N. J	24.10	.....	4.00	35.49
	b. Branch, Branchville Junction to Branchville, N. J	6.20	.....	1.19	
248	Syracuse, Binghamton and New York R. R.: Syracuse to Binghamton, N. Y	50.00	31.00	31.25	143.25
249	Syracuse, Chenango and New York R. R.: Syracuse to Earlville, N. Y	43.50	.....	2.00	45.00
250	Tennessee Coal, Iron, and Railroad: Tracy City, Tenn., to Junction at Cumberland Mountain Tunnel	18.00	.....	4.00	22.00
251	Texas, New Orleans and Louisiana Western R. R.:				
	a. Houston to Orange, Tex	106.00	.....	28.00	257.00
	b. Orange, Tex., to Vermillionville, La	112.00	.....	11.00	
252	Texas and Saint Louis Railway:				
	a. Cairo, Ill., to Texarkana, Ark	420.00	.....	18.00	771.00
	b. Texarkana, Ark., to Gatesville, Tex	317.00	.....	16.00	
253	Texas Western Railway: Houston to Sealey, Tex	53.00	.....	1.50	54.50
254	Texas Mexican Railway: Corpus Christi to Laredo, Tex	160.80	.....	16.57	177.37
255	Tioga Railroad:				
	a. Elmira, N. Y., to Morris, Pa	62.00	.....	12.00	81.50
	b. Blossburg to Morris Run, Pa	4.00	.....	.....	
	c. Tioga Junction to Lawrenceville, Pa	3.50	.....	.....	
256	Toledo, Ann Arbor and Grand Trunk R. R.: Toledo, Ohio, to South Lyon, Mich	61.00	.....	6.00	67.00
257	Toledo, Cincinnati and Saint Louis R. R.:*				
	a. Toledo, Ohio, to Charleston, Ill	320.00	.....	.....	589.00
	b. Delphos to Dayton, Ohio	95.00	.....	.....	
	c. Dayton to Wellston, Ohio	116.00	.....	.....	
	d. Dayton to Cincinnati, Ohio	53.00	.....	.....	
	e. Shanes and Soldiers' Home branch	5.00	.....	.....	
258	Towanda Coal: Towanda to Barclay, Pa	16.23	.....	4.00	20.23
259	Tuskegee R. R.: Tuskegee to Chehaw, Ala	5.33	.....	0.25	5.58
260	Utah Central R. R.: Ogden to Frisco, Utah	280.00	.....	.....	280.00
261	Utica and Black River R. R.:				
	a. Utica to Philadelphia, N. Y	87.00	.....	13.51	201.72
	b. Ogdensburg to Morristown, N. Y	10.00	.....	1.89	
	c. Carthage to Sackett's Harbor, N. Y	30.00	.....	1.58	
	d. Clayton to Theresa, N. Y	16.00	.....	1.36	
	e. Philadelphia to Morristown, N. Y	37.00	.....	3.38	

*Road of 3-foot gauge.

TABLE I.—*Names of companies reporting, with the names of branches, &c.*—Continued.

No.	Names of companies and connected points.	Length (including branches and leased lines).			
		Single track.	Double track.	Sidings.	Total.
		Miles.	*Miles.*	*Miles.*	*Miles.*
263	Valley Railway: Cleveland to Wheeling Junction, Ohio	75.50	.....	12.25	87.75
263	Vermont Valley R. R., of 1871: Brattleboro' to Bellows Falls, Vt	24.00	.....	2.34	26.34
264	Virginia Midland Railway:				
	a. Alexandria to North Danville, Va	286.60	.....	20.27	
	b. Manassas Junction to Strasburg, Va	60.40	.....	3.80	
	c. Warrenton Junction to Warrenton, Va	9.00	.....	0.33	381.00
	d. Orange Court-House to Gordonsville, Va	9.20	.....	0.90	
	e. Franklin Junction to Rocky Mount, Va	37.00	.....	3.50	
265	Vicksburg and Meridian R. R.: Meridian to Vicksburg, Miss	140.00	.....	.....	140.00
266	Virginia and Truckee R. R., and Carson and Colorado R. R.:				
	a. Virginia and Truckee R. R.*: Reno to Virginia City, Nev	52.00	.....	18.00	267.00
	b. Carson and Colorado R. R.†: Mound House to Virginia City, Nev	184.00	.....	18.00	
267	Washington and Western R. R.: Alexandria to Round Hill, Va	52.00	.....	3.00	55.00
268	Waynesburg and Washington R. R.: Waynesburg to Washington, Pa	27.80	.....	.....	27.80
269	Western Maryland R. R.:				
	a. Baltimore to Williamsport, Md	96.00	.....	13.00	145.10
	b. Edgemont, Md., to Shippensburg, Pa	33.60	.....	2.50	
270	Western R. R. of Alabama: Montgomery, Ala., to West Point, Ga	88.00	.....	.....	88.00
271	West Feliciana R. R.: Bayou Sara to Woodville, La	27.50	.....	.....	27.50
272	Western and Atlantic R. R.: Atlanta, Ga., to Chattanooga, Tenn	138.00	.....	40.00	178.00
273	Wheeling, Pittsburgh and Baltimore R. R.: Wheeling, W. Va., to Washington, Pa	32.00	.....	2.50	34.50
274	Williamstown R. R.: Alto to Williamstown, N. J	11.00	.....	1.50	12.50
275	Williamsport and North Branch R. R.: Hall's Station, P. and R. R. R., to Hugheesville, Pa	6.00	.....	1.00	7.00
276	Wilmington and Northern R. R.:				
	a. Wilmington, Del., to High's Junction, near Reading, Pa	70.50	.....	15.10	
	b. Springfield to Saint Peters, Pa	5.90	.....	.....	
	c. Dupont to Rockland, Del	1.00	.....	.....	96.00
	d. Delaware River Junction to Delaware River, near Wilmington	3.50	.....	.....	
277	Winona and Saint Peter R. R.:	320.00	.....	31.00	
	a. Winona, Minn., to Watertown, Dak	16.00	.....	1.10	
	b. Eyota to Plainview, Minn	12.30	.....	0.90	485.00
	c. Eyota to Chatfield, Minn	25.70	.....	1.50	
	d Rochester to Zumbrota, Minn	26.00	.....	1.10	
	e. Sleepy Eye to Redwood Falls, Minn	46.40	.....	3.00	
	f. Tracy Minn., to State Line				
278	Wisconsin Central Railway: Menasha to Ashland, Wis.	321.00	.....	25.00	346.00
279	Wood River Branch R. R.: Hope Valley to Wood River Junction, R. I	5.70	.....	0.80	6.50
280	Woodstock R. R.: White River Junction to Woodstock, Vt	14.00	.....	0.50	14.50
281	Worcester Railroad: Franklin City, Va., to Delaware State line	36.00	.....	1.75	37.75
282	Worcester and Nashua, and Nashua and Rochester R. R.: Worcester, Mass., to Rochester, N. H	78.00	17.00	16.00	128.00
283	York and Peach Bottom Railway: York to Delta, Pa	55.00	.....	2.50	57.50

* Wide gauge.
† Narrow gauge.

TABLE II.—*Size and number of ties used.*

No.	Length.	Breadth.	Depth.	Number.	No.	Length.	Breadth.	Depth.	Number.
	Feet.	*Inches.*	*Inches.*	*Per mile.*		*Feet.*	*Inches.*	*Inches.*	*Per mile.*
1	8	6	6	2,600	74	8	6	6	2,640
2	9	9	7	2,640	75	6½	8	6	2,816
3	8½	9	7	2,600	76	8	6	6	2,600
4	8½	7	7	2,816	77	8½	7	7	2,650
5	7	8	6	2,650	78	8	6	7	2,309
6	8	4–12	6	2,250	79	8	7–9	7	2,600
7	8	6	6	2,640	80	8	8–12	6	2,600
8	8	8	6	3,000	81	8	8–9	6½	2,300
9	8	8	6	2,300	82	8½	7	7	2,288
10	8	8	6	2,640	83	7–8[5]	6	6	3,000[5]
11	8½	7	7	2,300	84	8	7	6	2,640
12	8	8–12	7	3,000	85	6½–8[6]	7	7	3,000[6]
13	8½	7	7	2,816	86	8	8	6	2,600
14	8	9	6	2,640	87	8	8	6	.....
15	6	6	6	2,600	88	8	8	6	2,600
16	9	10	6	2,600	89	9	9	6	2,640
17	7	7	6	2,300	90	8	8½	6	2,640
18	6 and 7½	6 and 7	6 and 7	2,600	91	8	5–8	6	2,630
19	8	8	6½	3,000	92	8	8	7	2,640
20	8	5, 6, 7	6 and 7	2,640	93	6	6	6	2,640
21	8	6	6	2,640	94	8–8½	6–8	6	2,300
22	8	6–10	7	3,000	95	8	7–8	6–7	2,640
23	8	6–8	6	2,200–2,500	96	8	6	6	2,600
24	6	4–8	5–7	2,500	97	8½–9	8–12	7	2,640
25	6	6–8[1]	6	2,640[1]	98	8	10–12	7	2,100
26	6½	8	7	3,000	99	6	8	6	2,640
27	8	5–7	7–8	2,300	100	8	6	6	2,640
28	8½	8	7	2,641	101	8	8–9	6½–7	2,640
29	.....	.....	.....	.....	102	8	9	6½	2,700
30	8	8	6	2,640[1]	103	8	6–8	6	2,700
31	8	7	6	2,600	104	8	8	6	3,000
32	8½	7–12	7	2,640	105	6	7–10	5	3,200
33	8	9	7	2,640	106	8	9	6	2,300
34	8	9–10	6½	2,640	107	8	8	7	2,680
35	8	6–10	8	2,640	108	8½	8	6	2,640
36	8	8	6	2,500–3,000	109	8	8	6	2,640
37	9	12	6	2,640[2]	110	5–6	6	5½	2,640
38	8	8	6	2,300	111	8	6	6	2,600
39	8	6	6	3,168[3]	112	8	7–9	6	3,000
40	9	9	7	3,000	113	8	8	6	2,600
41	5½	9½	8	2,600	114	9	7–9	7	2,640
42	9	7	9	2,500	115	6	8	6	2,640
43	8½	9	7	2,640	116	8	8	6	2,350
44	8	8	6	2,640	117	8	8	6	2,640
45	8	8	6	2,600	118	8	8	6	2,640
46	8	Av. 8	6–7	2,640	119	8	9	6	2,250
47	8	8	6	2,640	120	6	6	5	3,000
48	8	8	6	2,600–3,000	121	8	8	6	2,640–3,000
49	8	8	6	.....	122	8½	8	7	2,640–2,800
50	8	6–9	6	2,300	123	8½	8	7	2,816
51	8	8	6	2,640	124	8	8	6	2,640
52	8½	8	6	3,000	125	8	8	6	3,000
53	8	6, 7[1]	6	2,300[1]	126	8	8	6	2,300
54	6	8	6	2,700	127	6½	8	7	2,900
55	8	10	6½	2,700	128	8	8	6	2,690
56	8	8	6½	2,600–2,800	129	8	6–9	6	.....
57	8	8–10	6	2,640	130	8½	12	8	.....
58	8	8–10	7	2,640	131	8	8–10	6	2,640–3,000
59	9	9	7	2,640	132	8–9	9	6½	2,300[7]
60	8	8	6	2,640	133	8	7	7	2,800
61	8	8	6	2,640	134	6	6	6	3,300
62	6	8	7	.....	135	6	8	6	2,640
63	8½	9	6	2,300	136	8	8	6	2,640
64	8½	8–9	7	2,700	137	8½–10	8–10	6–8	2,900
65	8½	9	7	2,640	138	8	9	6	2,640
66	8	7–8	6	2,640	139	8	8	6	2,640
67	7½	6	4	2,200	140	8½	6	6	2,640
68	8	6–10	6	2,640	141	8	6–10	6	2,640
69	6	7–8	6–7	2,600	142	8½	6–12	6	2,640[8]
70	9	7	9	2,640	143	7	8	6	2,640
71	8½	8	7	2,640	144	8	10	6	2,640
72	8½	8[4]	6[4]	3,000[4]	145	8	10	7	2,600
73	8	6–10	6	2,640	146	8	7–14	6	3,000

[1] This number in main track; 2,640 in branches.
[2] In stringer track 1,508 ties.
[3] This number is of oak; 3,000 of soft woods.
[4] On gravity road, 7 feet; on steam road, 8 feet.
[5] On broad-guage 8 feet; on narrow-guage, 6½ feet.
[6] Specifications are being changed to read 8½ feet, and 9x7 inches.
[7] Side tracks 2,200.
[8] Branches 2,000.

TABLE II.—*Size and number of ties used*—Continued.

No.	Length.	Breadth.	Depth.	Number.	No.	Length.	Breadth.	Depth.	Number.
	Feet.	*Inches.*	*Inches.*	*Per mile.*		*Feet.*	*Inches.*	*Inches.*	*Per mile.*
147	6	7–12	6	2,880	216	6	6	7	2,640
148	8	8	6	2,000	217	8	6–8	6–8	2,300–2,400
149	8	8	6½	2,640	218	6	9	6	2,500
150	7	10	7	2,500	219	8	6	6	2,640
151	9–10	10	7	2,640	220	6	7	6	2,000
152	8½	8	7	2,000	221	8	8	6	2,000
153	8	6	6	2,640	222	7	6–8	8	2,000
154	8½	8–10	7	2,640	223	8	6+	6	2,640
155	6–7	6–7	5–6	2,326	224	8	12	6	2,200
156	8	8–11	6	2,200	225	8	8–12	7	2,000
157	6	6	8	2,000	226	4½	7	6	3,520
158	8	8–12	7	2,000	227	8	8	6	2,800
159	8	6–10	6	2,800	228	9	12	6	2,640
160	.....	.....	.....	.....	229	8	12	6	2,640
161	8	7	6	2,816	230	8	9	6	2,460
162	8	6+	6	2,000	231	8½	7+	7	2,640
163	8	6–12	6½	2,000	232	9	8–9	6	2,640
164	8	6–12	6	2,700	233	8	8	6	2,000
165	8	8–9	6–7	2,640	234	6½	8	7	2,640
166	8	7–8	7	2,800	235	8	6	6	2,500
167	8	6+	6	2,000	236	8	6–8	6	2,640
168	8	6–10	6	2,800	237	8	8	6	2,500
169	10	8	6	2,640[1]	238	8	6+	6	2,500
170	9	8	6	3,000[2]	239	9	10	7	2,640
171	8	6+	6	2,800	240	8	7	6	2,500
172	8	6–8	6	2,640	241	6–8	8	6	2,640
173	9	8	7	2,640	242	8	8	6	2,640
174	8½	7	7	2,816	243	6	8	6	3,000
175	8	7	8	2,000	244	6	6	6	2,000
176	6	8	6	2,000	245	6	6	6	3,200
177	8	7	6½	2,640	246	8	6	6	2,640
178	8	9	6	3,000	247	8½	6–7	6	2,760
179	8½	8	6	1,700	248	8½	7	7	2,500
180	8	5–9	6	2,640	249	8	6–9	6	2,300
181	6½	8	7	3,000	250	8½	8	7	2,640
182	8	8	6	2,300–2,640	251	8	9–10	7	2,640
183	8–8½	8–12	6–7	2,000	252	6–7	6–8	6	2,640–3,000
184	8–8½	6–7	6–7	2,464–2,816	253	6	8	6	2,640
185	8½	8	7	2,800	254	6½	7	6	2,800
186	8½	8	7	2,800	255	8	6–12	6–7	2,640
187	8½	8	7	2,800	256	8	8	6	2,650
188	8½	8	7	2,900	257	6½	7	6	2,640
189	7	5	6	2,640	258	8	6–10	6	3,500
190	8	8	6	2,640	259	6	7	5	3,000
191	8	6–10	7	2,640	260	8	7	7	2,400
192	7	6	6	2,640	261	8	6	6	2,280
193	8	6	7	2,680	262	8	9	6	2,640
194	8½	7	7	2,600	263	8	6	6	2,640
195	8	6–7	6–7	2,640	264	8½	8	7	2,816
196	8	7	7	2,600	265	9	9	7	2,814
197	8½	7	7	2,283	266	6–8	8	6	2,640
198	6	6+	6	3,000	267	8	7–8	6	2,640
199	8	6–10	6	2,600	268	6	8	5	.....
200	8	6–8	6	2,200	269	8	6–12	6	2,700
201	6	5	5	2,640	270	9	9	6	3,520
202	8	6	6	2,000	271	9	8	6	2,500
203	8	4–10	6–8	2,640	272	8	9+	7	2,000
204	8	7	6	3,520	273	8½	7	7	2,800
205	8	10	7	2,400	274	8	7	8	2,500
206	8	9	7	2,600	275	8	8	7	.....
207	8	10	7	2,600	276	8	6–7	6–7	2,300
208	8	6	6	2,600	277	8	6–7	6–7	2,640
209	8	8	6	2,640	278	8	7	6	2,800
210	8	8	6	2,700	279	8	6–8	6	2,600
211	8–8½	7–9	6–7	2,780	280	8	6–8	6	2,240
212	7	8–12	6–8	2,500	281	8	6, 7, 8	6, 7, 8	2,640
213	8	7	6	.....	282	8	5–8	6–7	2,650
214	8	8	6	2,800	283	6	6	6	2,640
215	8	8	5	2,800					

[1] Ganga, 6 feet.

[2] In main line.

TABLE III.—*Kinds of timber used; its durability and cost per tie.*

1. Chestnut and white oak: 7 years; 35 cents. Hemlock: 3 years; 25 cents.
2. White and post oak: 7 years; 25 cents. Chestnut: 6 years; 25 cents. Longleaf heart pine: 6 years; 25 cents. White and post oak (from south of Birmingham): 6 years; 30 cents. The oak got from the south end of the road is not as durable by 1 year as that from the mountains on the north end.
3. White oak and rock oak: 8 years; 42 cents. The greater portion of ties last 9 years.
4. White oak: 7 years; 55 cents.
5. White oak, cypress, post oak, overcup oak, black locust, and sassafras; the last two in small quantities: 7 years; 20 cents.
6. Chestnut: 8 years; under 6-inch face, 25 cents; over 6-inch, 45 cents. White hemlock: 6 years; 35 to 48 cents.
7. Chestnut: 8 years; 40 cents.
8. White oak: 7½ years; 65 cents. White cedar: 45 cents; in use 4 years. Pine: 3 to 5½ years.
9. Pine: 45 to 55 cents; no experience in durability.
10. Tamarack: 7 years; 25 cents. Most satisfactory, in the absence of oak. Hemlock: 5 years; 22 cents. Cedar: 10 years; 20 cents. Not much used, because too soft for heavy traffic.
11. White oak and chestnut oak: 7 years; 30 to 50 cents. Branch from Bellaire to Columbus. White oak: 8 years; 40 cents.
12. White oak: 8 years; 40 cents.
13. White oak: about 7 years; 55 cents.
14. Cedar: 14 years; 28 cents. Juniper (tamarack): 7 years; 17½ cents.
15. Oak: 8 years; 25 cents.
16. Cypress: 10 years; 45 cents. Joint ties changed about once in 10 years; some of the others have been in use 20 years or more.
17. White oak: 7 years; 25 cents. Hewn ties of this price; those sawed, 20 cents.
18. White and rock oak (?): 8 years; 25 to 40 cents.
19. White and burr oak: 8 to 9 years; 40 cents.
20. Chestnut: 7 by 7, 50 cents; 6 by 7, 41 cents; 5 by 7, 35 cents; 5 by 6, 20 cents. Ties do not decay, but wear out in about 5 years.
21. Chestnut and cedar: 4 to 6 years; chestnut costs 45 cents; cedar, 36 cents.
22. Cedar: 8 years; 33 cents.
23. Chestnut: 8 years; 44 cents. Hemlock: 4 years; 28 cents.
24. Hemlock: 4 years; 30 cents. Cedar: 6 years; 35 cents. Oak: 8 years; 50 cents.
25. Southern cedar (cypress): 45 cents. Eastern cedar: 35 cents. Chestnut and oak: 50 cents. Experience in durability not reported.
26. Hemlock: 5½ years; 18 cents. Beech: 5 years; 18 cents.
27. Chestnut: 6 to 9 years; 50 to 65 cents. Pine and hemlock: 3 to 7 years; 40 to 50 cents. Some of the pine ties give out in 2 or 3 years; very few last over 5 years.
28. White oak: 8 years; 45 cents. Cherry: 8 years; 40 cents. Chestnut: 8 years; 30 cents. Hemlock: 8 years; 30 cents. All switch ties are made from white oak timber, not less than 7 inches thick, 392 lineal feet to the set. Cost, 8 cents per lineal foot.
30. White and burr oak: 6 years; 50 cents. All other kinds of oak: 4 years; 45 cents. White cedar: 44 cents. Red cedar: price and durability not stated.
31. Hemlock: 6 years; 25 cents. Spruce: 5 years; 18 cents. Tamarack: 8 years: 30 cents.
32. White oak: 60 to 70 cents. Chestnut: 50 to 60 cents. Spruce-pine: 30 to 40 cents. It is impossible to give accurate statements as to durability of ties. White oak lasts from 4 to 10 years, there appearing to be more difference in the durability of this timber than of many other kinds. Good young white chestnut will last 10 to 12 years before becoming useless from rot, but under heavy traffic will cut out under the rail so as to be useless before they rot. Spruce-pine will rot in 4 to 5 years. There is a great difference, also, in the durability of ties in different kinds of soil. In clay ground they rot faster than in sand, and in clean, sharp gravel, that admits of good drainage, they would attain their greatest life.
33. White oak, post oak, and pine: 7 years; 25 cents.
34. White and post oaks: 7 years; 30 cents. Long-leaf pine: 5 years; 25 cents. Black and red cypress, supposed to last 12 years: 30 cents.
35. White, chestnut, and black oaks, and chestnut: 8 years (ex. black oak: 5 years). The first two cost 60 cents and the last two 50 cents.

36. White, sugar, yellow, and pitch pines, red and white fir, from the Sierra Nevada Mountains: 6 to 9 years; 32 to 40 cents. In respect to durability, it is stated that this road from Truckee to Ogden has been operated only about fourteen years; from Lathrop to Goshen about ten years, and, excepting about 100 miles, the remainder for a still shorter time. Sierra Nevada Mountain timber fails from decay, and its durability in the form of ties depends upon the nature of the road-bed and ballast, as well as upon the kind of timber. The life of these ties is not over six years on sand and sandy or gravelly loam road-bed, while on alkali flats, or ground very strongly impregnated with salt, soda, &c., the average life is still undetermined. For example, between Desert and Mirage stations, respectively 348 and 366 miles from San Francisco, pine ties in 12 continuous miles of track over alkali flats are still perfectly sound, having been in use fourteen years. Redwood ties generally fail by cutting down of the rails rather than by rotting, though there are certain qualities of redwood timber which in some localities decay as rapidly as pine. Experiments are in progress to determine the effect of seasoning ties on the alkali flats before using them on sandy soils, so as to determine the life of the different kinds of ties under same conditions, &c., and it is thought that in a year or two some positive and exact statements can be made as to the result of this experience.
37. Pine: 5½ years; 35 cents. Cypress: 8 years; 40 cents. Oak: 10 years; 40 cents.
38. Oak: 8 years. Cedar: 6 years.
39. Hemlock: 5 years; 15 to 25 cents. Cedar: 15 to 20 years; 33 cents. Tamarack: 10 to 12 years; 31 cents.
40. Long-leaf pine: 7 years; 25 cents. White, post, and chestnut oaks: 10 years; 30 cents. The durability is not yet ascertained from actual test.
41. Spruce and Tamarack: 10 cents.
42. Yellow and pitch pine: 10 years; 25 cents.
43. White oak: about 7 years; 40 cents.
44. White and burr oak: 10 years; 45 cents.
45. White and burr oak, first class: 6 years; 36 cents, on ground. Same, second class: 6 years; 20 cents, along line of road.
46. Oak: 10 years; 40 cents. Cedar: 5 years; 25 cents. Hemlock: 5 years; 25 cents. Tamarack: 5 years; 25 cents. Black ash: 4 years; 22 cents. The last named is used in but very small quantities.
47. Hemlock: 4 years; 35 cents. Cedar: 5 years; 35 cents. White oak: 8 years; 20 cents.
48. Principally white oak; some cedar; 50 cents.
49. White oak: 8 years; 23 cents. Hemlock: 4 years; 14 cents.
50. White and burr oak: 10 years; 40 to 60 cents. Black walnut: 7 years; 25 to 45 cents. Wild cherry: 7 years; 25 to 45 cents. Black locust: 8 years; 35 to 50 cents. Red elm: 6 years; 20 to 30 cents. White cedar: 7 years; 40 cents.
51. White oak: 7 to 8 years; 40 cents. Red elm: 4 to 5 years; 35 cents. Narrow-gauge ties, of the same material as the standard, cost from 20 to 25 cents.
52. Oak: 7 years; 25 cents. Hemlock: 5 years; 18 cents.
53. White oak: 9 years; 35 cents. Burr oak: 9 years; 35 cents. Red oak: 4 years; 16 cents. Rock elm: 6 years; 25 cents. Tamarack: 6 years; 25 cents. White pine: 7 years; 25 cents. Norway pine: 4 years; 20 cents. Hemlock: 7 years; 25 cents.
54. White oak: 6 years; 25 cents. Chestnut: 6 years; 30 cents.
55. White oak, red cherry, and black walnut: 8 years; 47 cents.
56. White and burr oak: 8 years; 35 cents.
57. White oak of all kinds: 6 to 7 years; 35 cents. Chestnut oak: 7 years; 35 cents.
58. White and burr oak: 8 years; 35 cents.
59. White oak and post oak: 6 years; 30 cents. Heart pine: 5 years; 28 cents.
60. Burr, white, and sweet oaks: 30 cents. Red, pin, and black oaks: 20 cents. Red elm: 30 cents. Black ash: 15 cents. These ties have been in use but one year, and their durability is not known.
61. White, burr, and pin oaks: 8 years; 35 cents. Owing to the large demand for ties in construction the average price during the past year has been more than 35 cents.
62. White, red, and chestnut oaks: 15 cents. Road but three years old, and ties still good.
63. White and burr oaks chiefly: 8 years; 46 cents.
64. White oak: hewed, 8 years; 45 cents; sawed, 7 years; 40 cents. Hewed red oak: 5 years; 30 cents; sawed, 4 years; 30 cents. It is noticed that 40 to 45 cents are comparatively cheap prices for first-class white oak. They are bought directly from the tie-makers at ready cash. First-class ties will last 10 to 12 years on the sidings.
65. White oak: hewed, 7 years; 52 cents; sawed, 5 years; 35 cents.

66. White oak: hewed, 6 years; 45 cents; sawed, 6 years; 45 cents.
67. White oak: 5 years; 30 cents. Some cedar ties laid in 1849-'50 are sound now (1883).
68. Chestnut, white oak, red oak, and some black oak: 7 years; 50 cents.
69. Chiefly oak: 7 years; 45 cents.
70. Native pine: 30 cents. White oak, chestnut oak, and post oak: 35 cents; 5 to 7 years.
71. White oak: 7 years; 50 cents. Burr oak: 5 years; 50 cents. Black walnut, 7 years; 50 cents. Wild cherry: 7 years; 50 cents. Red elm: 6 years; 50 cents. White ash: 4 years; 50 cents. Black ash: 2 years; 50 cents. Jack oak: 3 years; 35 cents. Red oak: 2 years. Pin oak: 4 years. Bastard oak: 4 years. Black oak: 2 years.
72. White oak, chestnut oak: 35 cents. Neither division of this road is old enough to test durability.
73. Chestnut: 10 years; 40 cents. Cedar: 9 years; 38 cents. Hemlock: 5 years; 25 cents.
74. Chestnut: 8 years; 40 cents.
75. White oak, yellow oak, swamp oak, cherry, and black walnut: cost varies; at present, 25 cents.
76. Cedar: 12 years; 25 cents. Hemlock: 6 years; 20 cents. Tamarack: 8 years; 20 cents.
77. Spruce, pine, and white oak: 5 years; spruce, 50 cents; oak, 75 cents.
78. White oak: 7 years; 38 cents. Rock or chestnut oak: 6 years; 38 cents. Black walnut: 7 years; 38 cents. Locust: 7 years; 38 cents. Few black walnut ties are received. Locust probably lasts longer, but too few have been received to make the experiment valuable.
79. White oak and rock oak: 8 years; 50 cents.
80. Chestnut: 8 to 10 years; 40 to 50 cents.
81. White oak, black walnut, mulberry, yellow locust, butternut, and red cherry: 6 years if hewn, 5 years if sawed; 40 cents each kind.
82. White oak: 7 years, 80 cents. Red oak: 4 years; 50 cents. Chestnut: 6 years; 60 cents. Rock oak: 7 years; 80 cents.
83. *Susquehanna division.*—Oak: 8 years; 45 cents. Chestnut: 6 years; 38 cents. Hemlock: 4 years; 30 cents.
Saratoga division.—Oak: 8 years; 45 cents. Chestnut: 6 years; 45 cents. Hemlock; 4 years; 30 cents.
Champlain division.—Tamarack: 6 years; 38 cents. Hemlock: 4 years; 30 cents.
83. *d. s.* White oak: 8 years; 40 to 50 cents. Chestnut: 6 years; 30 to 40 cents.
84. Oak: 11½ years; 75 cents. Hemlock: 6 years; 35 cents. Black ash: 5 years; 25 cents. Rock elm (experiment): 35 cents. Chestnut: 11½ years; 45 cents. Maple: 7 years; 25 cents. Pine: 7 years; 25 cents. Cedar: 12 years; 33 cents. Tamarack: 7 years; 35 cents.
85. Pine, red and white spruce: 3 years; 60 cents for broad-gauge (8 feet) and 40 cents for narrow-gauge (6½ feet) ties.
86. White cedar: 7 years; 40 cents. White and burr oaks: 9 years; 50 cents. Honey locust: 10 years; 50 cents. Black walnut: 9 years; 50 cents. White walnut: 7 years; 45 cents. Red elm: 9 years; 50 cents (butt cut). Coffee-nut: 10 years; 50 cents. Black cherry: 10 years; 50 cents.
87. Oak: 8 years; 30 cents. Hemlock: 5 years; 18 cents.
88. Oak: 35 cents.
89. White oak: 8 years; 40 cents. Hemlock: 5 years; 25 cents.
90. Hemlock, tamarack, spruce, cedar, and Norway pine: 25 cents. Of the last two, but 25 per cent. are allowed in specifications. As the road was opened only last season, experience has not been had as to durability.
91. White oak, red elm, red oak, and butternut: 45 cents. No experience has been gained in durability, as the road is new.
92. White oak: 55 cents.
93. White and rock oak: 5½ years; 22 cents.
94. Cedar: 7 to 9 years; average, 33 cents. Hemlock: 5 years; average, 26 cents. White pine for switches: $15 per 1,000 feet. Southern pine for bridge ties: $25 per 1,000 feet; lasting 5 to 7 years.
95. White oak: 6 years; 23 cents.
96. Oak and cypress: 8 years; 35 cents.
97. White oak: 8.2 years; 35 cents. Yellow pine: 5 years; 25 to 30 cents.
98. White oak: about 7 years; 68 cents.
99. Post oak: 6 years; 18 cents.
100. Cypress: 26 cents; yellow pine for switch-timber. No ties have been taken out since the road was constructed in 1881.
101. White and chestnut oak, locust and post oak: 6 to 8 years; 25 to 30 cents. Chestnut has been used to some extent, but does not seem to hold the spikes as well as the same kind of wood found farther north.

102. White and burr oak: 7 years; 37½ cents. This price includes cost of distributing where they are to be put in the track. The cost delivered on right of way for first-class ties is 30 cents, and for second-class, 25 cents each.
103. Chestnut: 6 years; 50 cents.
104. White oak: 8 years; 35 cents. Hemlock: 6 years; 15 cents. Rock elm: 6 years; 20 cents.
105. Hemlock: 6 years; 15 cents (sawed on four sides). Cedar: 20 cents (sawed on two sides).
106. White oak: 8 years; 38 cents.
107*a*. White oak: 8 years; 45 cents. Chestnut: 6 years; 35 cents. Hemlock: 5 years; 25 cents. Cedar (durability unknown): 50 cents.
107*b*. White oak: 8 years; 50 cents. Chestnut: 6 years; 40 cents. Hemlock: 5 years; 30 cents. Cedar: 50 cents.
108. White oak: 8 years; 30 cents. Hemlock: 4 to 5 years; 16 cents. White cedar: 8 to 10 years on straight track; 16 cents.
109. White oak, tamarack or hackmatack, hemlock, and cedar: 6 to 7 years; 15 to 60 cents; average, 26¼ cents.
110. White oak: 5 years; 20 cents.
111. Chestnut and oak: 8 years; 30 to 35 cents.
112. White oak: 9 years; 41 cents.
113. Chestnut: 7 years; 42 cents.
114. Post oak: 6 years; 60 cents. Long-leaf pine: 6 years; 67½ cents. Red cypress: 7 years; 85 cents. Red cedar: 10 years; 80 cents. Bois d'Arc (durability not known; wears out but does not rot): $1.15. Short-leaved pine (creosoted; durability not known; used 3 years without perceptible change): $1.15.
115. Chiefly white oak; also mulberry and the heart of the long-leaf pine: 6 years; 22 cents.
116. White, post, and burr oak: 9 years; 30 to 50 cents. Cedar: 8 years; 30 to 35 cents.
117. White and burr oak: 8 years; 30 cents. Black oak: 6 years; 25 cents.
118. Post oak, over-cup oak, and white oak: 5 years; 43 cents. Red oak: 3 years; 37 cents.
119. White oak: 8 years; 37 cents.
120. White oak: 25 cents. Red oak: 18 cents. Elm oak (?): 15 cents. Butternut: 15 cents. Black walnut: 20 cents. Durability of each, 7 years. Delivered in 1872; lasted till 1879–'80.
121. White oak: 8 years; 40 cents. Second-growth chestnut: 6 years; 35 cents. Cedar (just put in). Red beech: 30 cents. White beech: 4 years; 25 cents. Hemlock: 5 years; 25 cents. White ash: 4 years; 25 cents. Black ash; 4 years; 25 cents. Red oak: 6 years; 30 cents. Soft maple: 4 to 5 years; 25 cents.
122. White oak: 7 years; 37 cents.
123. White oak and rock oak: 7 years (on stone ballast); 75 cents.
124. White, burr, and post oak: 8 years; 56 cents.
125. Oak: 62 cents.
126. White and burr oak: 7 years; 55 to 60 cents. Some white cedar, but the durability has not been tested in this soil and climate.
127. Beech: 5 years; 17 cents. Hemlock: 5 years; 17 cents. Chestnut: 5 years; 17 cents.
128. White oak: 37 cents.
129. Cedar: 10 to 15 years; 35 cents.
130. Post oak and white oak: 10 years; 36 cents.
131. White and burr oak: 9 years; 30 cents.
132. White and burr oak: 9 years; 47.7 cents. Cedar: 10 years; 30.9 cents.
133. White and rock oak: 7 years; 70 cents. White chestnut: 6 years; 50 cents. Cypress: 7 years; 65 cents. Cedar: 6 years; 53 cents.
134. White oak: 4 years; 11 cents. Cypress: 11 cents. Ash: 3 years; 11 cents.
135. Post, white, and over-cup oak: 5 years; 25 cents. Red oak: 2½ years; 17 cents. Walnut, mulberry, sassafras, and cypress: the last good after 10 years' service, the others perfectly sound after 9 years.
136. White and post oak: 7 years; 32 cents.
137. White and post oak: 7 years; 50 cents between Cincinnati and Louisville and 35 to 27 cents elsewhere. Yellow pine: 6 years; 25 to 30 cents. Black cypress: 10 years; 50 cents. The ties got between Cincinnati and Louisville are made of white or post oak, from about the head-waters of the Kentucky River, and are floated down to Franklin. The timber is of excellent quality. On the road from Louisville to Birmingham, Ala. (on the way to New Orleans), from East Saint Louis, Ill., to Marshall, Tenn., and from Memphis, Tenn., to Memphis Junction, Ky., ties are used that are made of post oak from adjoining lands, and the quality is good. From Birmingham to Mobile, including the Selma and Pensacola branches, yellow pine is used from adjoining lands, and of good quality. From Mobile to New Orleans preference is given to black cypress, and more than half of the road is laid in this timber, the rest being yellow pine. Black cypress is the best material known of for cross-ties.

138. White oak: 8 years; 30 cents.
139. Cedar: 6 to 8 years; west of Bangor costs 31 cents; east of Bangor costs 22 cents. Juniper (tamarack): 4 to 6 years; west of Bangor costs 25 cents; east of Bangor costs 21 cents. Hemlock: 2 to 4 years (west of Bangor); costs 24 cents.
140. Yellow pine: 8 years; 90 cents.
141. Cedar: 9 years; 36 cents. Chestnut: 9 years; 40 cents.
142. Hemlock, tamarack, and cedar: 8 years; 20 to 25 cents.
143. White oak: 5 years; 30 cents. Cypress: 6 years; 30 cents.
144. White oak, post oak: 6 years: 40 cents. Overcup oak: 5 years; 40 cents. Heart yellow pine: 5 years; 40 cents. Cypress: 8 years; 45 cents.
145. Long leaf or heart pine: 5 years; 22½ cents.
146. Hemlock: 7 years; 25 cents. Tamarack: 7 years; 25 cents. Cedar (put in track in 1873, and still good in 1883); 30 cents. Rock elm: 7 years: 25 cents. White oak: 12 years; 50 cents.
147. Hemlock: 8 years; 20 cents.
148. Elm, white oak, and tamarack: 5 years.
149. White, post, and burr oaks, black walnut, red cherry, and coffee bean: 7 years; 36¼ cents.
150. Pine: 2 years; 30 cents.
151. Cypress: 8 to 10 years; 35 to 50 cents.
152. White or rock oak: 7 years; 44 cents. Ties laid in gravel.
153. Chestnut: 55 cents. Road in operation but 6 years. Used in 5th year 1,500; in 6th year, 2,000; and in 7th year, probably 5,000.
154. White and post oak: 7 years; 30 cents.
155. Cypress (sawn): 7 to 8 years; 38 cents. Oak (large trees split and hewn): 4 to 5 years; 25 cents. Oak (trees that make but one tie to a length): 6 to 7 years; 25 cents.
156. Chestnut, oak, and butternut: 6½ years; 50 cents.
157. California pine: 7 years; 35 cents.
158. White oak: 8 years; 40 cents.
159. Chestnut, white oak, rock oak, and a few black oak: 7 years; 50 cents.
161. Chestnut: 8 years; 40 cents. Oak: 7 years; 40 cents. Hemlock: 20 cents. Pine: 40 cents. Of the last three but very few are used.
162. Young white chestnut: 6 years; 35 cents. Old yellow chestnut: 5 years; 30 to 32 cents.
163. Hemlock: 6 years; 15 cents. Cedar: 15 years; 20 cents. Tamarack: 10 years; 17 cents.
164. Chestnut and oak: 8 years; 20 cents (under size) to 40 cents (full size).
165. Southern yellow pine: 9 years; 77 cents. White oak: 8 years; 80 cents. White chestnut: 8 years; 62 cents. Yellow cedar: 8 to 10 years; 53 cents. The yellow cedar ties are only used in branches and sidings, and not on the main line.
166. Rock, white, or yellow oak: 7 years; 38 to 45 cents. White chestnut: 6 years; 38 to 45 cents.
167. Chestnut and white oak: 9 years; 48 cents.
168. Chestnut: 10 years; white oak: 8 years; rock oak: 6 years; yellow pine: 6 years; cost of each 55 cents. Bark removed before using.
169. White oak: 8 years; 65 cents. Chestnut: 5 years; 50 cents. Hemlock: 3½ years; 30 cents. Broad gauge (6 feet). These are the kinds used formerly. Now a third rail has been laid on some portions. On the parts where the gauge is reduced the ties now used are 8½ feet by 8 by 6 inches.
170. White oak: 8 years; 50 cents. Chestnut: 8 years; 35 cents. Red oak: 6 years; 35 cents. Hemlock: 4 years; 30 cents. Black ash: 4 years; 30 cents. Hard maple: 4 years; 30 cents. Red elm: 8 years; 50 cents. White oak and chestnut are the woods principally used. The others come in incidentally with the contracts, or are used for special purposes on temporary tracks, or on unimportant sidings.
171. Chestnut: 45 cents.
172. Chestnut and white oak: 7 years; 50 cents.
173. White and post oak, cypress and juniper (white cedar): 6 years; 45 cents.
174. White oak: about 7 years; 65 cents.
175. White oak: 35 cents. White pine, jack pine, swamp elm, cottonwood, and tamarack: each 25 cents. Average durability of all kinds: 5 years.
176. Redwood: 8 years; 40 cents.
177. Hemlock: 5 years; 20 cents. Tamarack: 8 years; 25 cents.
178. White oak: 7 years; 38 cents.
179. White oak: 7 years; 45 cents.
180. Chestnut: 8 years; 50 cents. Cedar: 8 years; 35 cents.
181. Hemlock: 5 years; 18 cents. Beech: 5 years; 18 cents.
182. Red and yellow fir: 8 years; 20 cents.
183. White oak: 8 years; 45 cents. Beech and maple: 3 years; 30 cents. Cedars (durability not tested): 35 cents.

184. White oak: 8 years; 80 cents. (This applies to first-class ties used in the main running lines.) White oak, second class: 5 to 8 years; 70 cents. Chestnut, cypress, and hackmatack: 5 to 8 years; 60 cents. (In branch roads.) All ties hewn, and no preserving process employed.
185. White oak: 55 cents.
186. White oak.
187. White oak.
188. White oak: 7 years; 56 cents. White cedar: 7 years; 50 cents.
189. Chestnut: 8 years; 35 cents.
190. White and burr oak: 8 years; 35 cents.
191. White oak: 8 years; 96 cents. Black oak: 2 to 4 years; 80 cents. White pine: 8 years; 50 cents. Of the last two but very few used.
192. Oak and chestnut: 5 years; 30 cents for oak; 26 cents for chestnut.
193. White oak: 8 years; 50 cents. Chestnut: 6 years; 40 cents. Hemlock: 5 years; 30 cents. Cedar (durability not known): 50 cents.
194. White oak: 7 years; 40 cents.
195. White and rock oak: first class, 70 to 80 cents; second class, 65 cents; third class, 60 cents; durability of each, 10 years. White chestnut: first class, 55 cents; second class, 50 cents; third class, 45 cents; durability of each, 12 years. Black and red oak are so short-lived that they are not accepted.
196. White oak: 10 years; 89 cents. Black oak: 2 years; 53 cents. Chestnut: 7 years; 63 cents.
197. White oak: 7 years; 80 cents. Red oak: 4 years; 50 cents. Chestnut oak: 6 years; 60 cents. Rock oak: 7 years; 80 cents. The years I reported are but approximate, no exact observations having been made.
198. Cedar, oak, cherry, hemlock, tamarac, and black ash, 12 cents. A new road and durability not tested; some removals have been made, chiefly of black ash.
199 Old-growth white oak: 7 years; 40 cents. Second-growth red oak: 6 years; 40 cents. Hemlock: 6 years; 25 cents. Spruce: 6 years; 25 cents. Cedar: 10 years; 35 cents. Old-growth hackmatack: 10 years; 35 cents. Brown ash: 7 years; 30 cents. Of the latter but very few now used.
200. Cedar: 9 years; 35 cents.
201. White oak: over 6 years; 12½ cents.
202. Oak and chesnut: 7 to 8 years; 48 cents.
203. Chestnut: 7 years; average 48 cents.
204. Chestnut: 7 years; 45 cents. Cedar: 40 cents. Pine: 35 cents. The last two in use but one year.
205. Long-leaf pine: 7 years; 22 cents. White and post oak: 10 years; 27 cents. Have used some juniper (white cedar of coast), but the wood is too soft for curves, but it lasts very well, perhaps 12 years on an average.
206. White and post oaks: 7 years; 32 to 87 cents.
207. White oak, chestnut, and black oak, chiefly the first: 6 years; 61 cents.
208. Chestnut: 38 cents.
209. White oak: 34 cents. This being a new road, experience as to durability has not been had.
210. White oak: 6 years; 35 cents. Have also used post oak, walnut, and hard pine with good results as to durability. Hard pine and walnut will last 7 years on an average, the cost per tie being the same.
211. White oak, post oak, and chestnut: 8 years; 40 to 50 cents.
212. Mesquite: 62½ cents. Dimensions, depths and breadths as reported are approximate. Durability unknown.
213. White oak: 3 years; 20 cents.
214. Chestnut: 8 years; 41 cents. Red oak: 10 years; 55 cents. Hemlock: 5 years; 29 cents. No special experiments have been made as to durability, but observation shows that this is greatly increased where the ties are supported upon stone ballast. Gravel tends to increase the durability, as shown by comparison with places where the ties were left in clay or loam, which greatly shorten their life.
215. White oak: 7 years; 50 cents. White cedar: 7 years; 25 cents.
216. Post and white oak: 6 years; 18 cents.
217. Hemlock: 7 to 8 years; 17 cents. Hackmatack: 8 to 10 years; 20 cents. Yellow oak: 8 to 10 years; 20 cents.
218. Florida, yellow, or pitch pine: 5 years; 15 cents. The yellow pine is considered better than the pitch pine in this region.
219. Hemlock: 7 years; 22 cents. Brown ash: 7 years; 22 cents. Cedar: 12 years; 31 cents. Tamarack: 10 years: 31 cents.
220. White and burr oak: 8 years; 18 cents.
221. White, post, and black oak: 22 cents.
222. White oak, post oak, red elm, and burr oak: 7 years; 40 cents.

223. White oak: 8 years; 33 cents. Tamarack: 5 years; 25 cents. White pine: 7 years; 22 cents. Butternut: 6 years; 25 cents. Rock elm 6 years; 25 cents Red oak: 6 years; 25 cents. Red elm: 5 years; 25 cents. White ash: 5 years; 25 cents.
224. Pine: 6 years; 30 cents.
225. White and burr oak: 7 to 8 years; 35 to 40 cents.
226. Cedar: 10 years; 10 cents.
227. Redwood: 9 years; 40 cents.
228. Live pine or lightwood: 7 years; 25 cents. Durability on basis of many years' record. Cypress: 10 years; 30 cents. Durability approximate; 7 inches heart on both faces, required.
229. Pine and oak: 5½ years; 35 cents.
230. White oak and post oak: 8 years; 45 cents. These woods preferred. Cypress heart: 8 years; 40 cents. Juniper (white cedar) heart. These woods are more durable in the weather than white or post oak, but they are softer and wear away under the rails, making their durability about equal to those woods. They are too soft to hold spikes well on strong curves.
231. White, post, and chestnut oak: 7 years; 40 cents. Chestnut: 5 years; 35 cents.
232. White oak: 7 years; 35 hewn, 37½ sawn.
233. Chestnut: 10 years; 35 cents. White oak: 10 years; 35 cents.
234. White and post oak: 5 years; 18 cents.
235. Oak, chestnut: 6 years; 35 cents for chestnut, 50 cents for oak.
236. Oak: 10 years; 65 cents. Red elm: 8 years; 60 cents. Hemlock: 6 years; 45 cents. Cedar: 6 years; 45 cents. Tamarack: 6 years; 45 cents.
237. Oak, cedar: 7 years; 70 cents. Hemlock: 5 years; 45 cents. Chestnut: 7 years; 70 cents.
238. Cedar: 12 years; 30 cents.
239. Yellow pine: 6 years; 22 cents. Cypress: 10 years; 28 cents.
240. Oak: 6 years; 40 cents. Chestnut: 5 years; 40 cents. Hemlock; 4 years; 20 cents. Cedar: 8 years; 35 cents. Soft maple: 4 years; 20 cents. Cherry: 6 years; 30 cents. Birch: 5 years; 20 cents.
241. Redwood: 10 years; 30 cents.
242. Redwood; 14 years; 37½ cents.
243. White, burr, yellow, and jack oak: 8 years; 20 cents.
244. Hemlock: 5 years; 18 cents.
245. Principally chestnut; 25 cents.
246. Cedar and chestnut: 8 years; 40 cents.
247. Oak and chestnut: 7 years; 51 cents. Mountain timber, Sussex County, N. J.
248. Oak: 50 cents. Chestnut: 45 cents. Hemlock: 25 cents. Cherry: 40 cents.
249. Hemlock: 7 years (with light tonnage); 30 cents. Cedar: 10 years; 50 cents.
250. White oak: 6 years; 25 cents. Post oak: 25 cents. Chestnut oak: 6 years; 25 cents.
251. Long-leaf yellow pine: 5 years; 45 cents. Black and yellow cypress: 10 to 12 years; 45 cents. The latter is now used exclusively.
252. White oak, overcup oak, walnut, and cypress: 4 to 5 years; 16 to 20 cents.
253. Pine: 6 years; 41 cents. Post oak: 4 years; 40 cents.
254. Pine and mesquit: 6 years: 75 cents.
255. Hemlock: 5 years; 22 cents (cull ties half price). Chestnut: 8 years; 35 cents. Oak: 10 years; 45 cents.
256. White, swamp, and red oak, black ash: 37½ cents. The road has not been in operation long enough to test the durability of ties.
257. White and burr oak: 7 years; 25 to 35 cents.
258. Oak: 6 years; 25 cents.
259. Yellow pine: 3 years; 18 cents. Ties of light wood are expected to last 6 to 8 years.
260. Red pine: 8 years; 50 cents.
261. Hemlock: 6 years; 22 cents. Spruce: 5 years; 18 cents. Tamarack: 8 years; 24 cents. About 1 per cent. are of the last two kinds.
262. White oak: 45 cents. Black and pin oak: 35 cents. Chestnut: 40 cents. Wild cherry: 40 cents. White cedar (from Michigan): 35 cents. Red elm: 40 cents.
263. Chestnut: 8 years; 40 cents.
264. Chestnut oak: 7 years; 35 cents. White oak, post oak———
265. Pine: 4 years; 30 cents.
266*a*. Sugar pine: 5 years; 65 cents. Red fir: 5 years; 65 cents.
266*b*. Redwood: 15 years; 53 cents. Sugar pine: 8 years; 45 cents. Red fir: 6 years; 45 cents.
267. White oak: 10 years; 35 cents. Ties are found to last much longer on stone ballast.
268. White oak: 25 cents.

269. White oak, rock oak: 6 to 7 years; 45 cents. Chestnut: 5 to 7 years; 35 cents.
270. Yellow pine: 7½ years; 29 cents. All heart timber.
271. Cypress: 10 years; 45 cents. The sizes given are those mentioned in contract; will go 6 × 10 on 6½ × 10½.
272. White oak and post oak: 6 years; 40 cents. Hewn on two sides.
273. White oak: 7 years; 30 cents.
274. Cedar: 10 years; 60 cents. Spruce pine, 48 cents. Chestnut, 7 years; 65 cents; white oak, 8 years; 90 cents.
275. Hemlock: 4 years; 20 cents. Oak: 7 years; 50 cents.
276. White oak: 10 years; 53 cents. Chestnut: 10 years; 42 cents. Cypress; 10 years; 55 cents.
277. White oak: 7 years; 40 cents. Red elm: 5 years; 35 cents. White cedar: 8 years; 40 cents. White elm: 4 years; 30 cents.
278. White oak: 10 years; 30 cents. Hemlock: 7 years; 20 cents. Tamarack: 7 years; Cedar: 8 years; 22 cents.
279. Chestnut and oak: 8 years; 45 cents.
280. Hemlock: 6 years; 25 cents. Cedar, 33 cents.
281. White oak: 7 years; 42½ cents.
282. Chestnut: 7 years; 42 cents.
283. Rock oak: 8 years; 25 cents. White oak: 8 years; 25 cents. Chestnut: 5 years; 22 cents.

CONCLUSIONS.

In attempting to draw conclusions from the above data, it must be borne in mind that the values of the several items reported are very unequal, as some represent the combined experience of companies that have been long in operation and use great quantities of ties, while others are reported from newer roads and for shorter lines. Were they of uniform value in this respect, we might ascertain the relative order of the different kinds of timber used, by multiplying the numbers representing the years of duration by the cost. But as in many instances, either the years of durability or the price are omitted or stated in an uncertain manner, we will only attempt to summarize the numbers under each kind of timber, and the range of prices of each.

In importance, we find the various kinds of timber in the following order, viz: Oaks, pines, chestnut, hemlock, cedars, tamarack, cypress, elms, ash, cherry, black walnut, firs, spruce, beech, locust, redwood, maple, butternut, coffeenut, mulberry, and mesquit, and a single mention each of birch, cottonwood, honey locust, Osage orange, and sassafras.

Upon summarizing the years of durability and the prices we find the following results, with the several kinds, in the order above enumerated as follows:

OAK (NOT SPECIFIED AS TO KIND).

Durability.—Four years, 1; 4 to 5 years, 1; 5 years, 2; 5½ years, 1; 6 years, 3; 6½ years, 1; 6 to 7 years, 1; 7 years, 6; 7 to 8 years, 1; 8 years, 10 years, 4; 11½ years 1. Average of 32 cases reported, 7.4 years.

Prices.—Twenty cents, 1; 25 cents, 5; 30 cents, 3; 30 to 35 cents, 1; 35 cents, 3; 40 cents, 4; 45 cents, 6; 48 cents, 1; 50 cents, 6; 51 cents, 1; 62 cents 1; 65 cents, 1; 70 cents 1 Average of 34 cases reported, 41.2 cents.

WHITE OAK.

Durability.—3 years, 1; 4 years, 1; 4 to 5 years, 1; 5 years, 8; 5 years, if sawn, or 6 if hewn, 1; 5½ years, 1; 5 to 7 years, 1; 5 to 8 years, 1; 6 years, 18; 6 to 7 years, 1; 6 to 8 years, 1; 7 years, 46; 7½ years, 1; 7 to 8 years, 2; 8 years, 47; 9 years, 9; 10 years, 11; 12 years 1. Average of 152 cases, 7.3 years.

Prices.—12 cents, 1; 12½ cents, 1; 15 cents, 1; 16 to 20 cents, 1; 18 cents, 3; 20 cents, 8; 22 cents, 4; 23 cents, 2; 25 cents, 9; 25 to 30 cents, 2; 25 to 40 cents, 1; 26½ cents, 1; 27 cents, 2; 28 cents, 1; 30 cents, 14; 30 to 50 cents, 2; 32 cents, 1; 33 cents, 2; 34 cents, 1; 35 cents, 20; 35 to 40 cents, 1; 36 cents, 2; 36½ cents, 1; 37 cents, 4; 38 cents, 2; 38 to 40 cents, 1; 40 cents, 17; 40 to 50 cents, 2; 40 to 60 cents, 1; 41 cents, 1; 42 cents, 2; 43 cents, 1; 44 cents, 1; 45 cents, 13; 46 cents, 1; 47 cents, 1; 48 cents, 2; 50 cents, 15; 52 cents, 1; 53 cents, 1; 55 cents, 4; 56 cents, 2; 60 cents, 1; 60 to 70 cents, 1; 61 cents, 1; 65 cents, 4; 68 cents, 1; 70 cents, 2; 70 to 80 cents, 1; 75 cents, 2; 80 cents, 4; 89 cents, 1; 90 cents, 1; 96 cents, 1. Average of 173 cases, 40.6 cents.

POST OAK.

Durability.—4 years, 1; 5 years, 3; 5 to 7 years, 1; 6 years, 8; 6 to 8 years, 1; 7 years, 10; 8 years, 3; 9 years, 1; 10 years, 3. Average of 31 cases, 7 years.

Prices.—18 cents, 3; 20 cents, 1; 22 cents, 1; 25 cents, 4; 25 to 30 cents, 1; 30 cents, 5; 27 cents, 2; 30 to 50 cents, 1; 33 cents, 1; 35 cents, 2; 36 cents, 1; 36½ cents, 1; 40 cents, 5; 40 to 50 cents, 1; 43 cents, 1; 45 cents, 2; 50 cents, 1; 60 cents, 1. Average of 34 cases, 33 cents.

BURR OAK.

Durability.—4 to 5 years, 1; 5 years, 4; 6 years, 2; 7 years, 6; 8 years, 8; 8 to 9 years, 1; 9 years, 5; 10 years, 2. Average of 29 cases, 7.4 years.

Prices.—16 to 20 cents, 1; 20 cents, 2; 25 cents, 2; 30 cents, 3; 30 to 50 cents, 1; 32 cents, 1; 35 cents, 5; 36 cents, 1; 36½ cents, 1; 37½ cents, 1; 40 cents, 3; 40 to 60 cents, 1; 43 cents, 1; 45 cents, 1; 46 cents, 1; 48 cents, 1; 50 cents, 3; 55 to 60 cents, 1; 56 cents, 1. Average of 31 cases, 37.8 cents.

ROCK OAK.

Durability.—4 years, 1; 5 years, 1; 5½ years, 1; 6 years, 1; 6 to 7 years, 1; 7 years, 7; 8 years, 4; 9 years, 1; 10 years, 1. Average of 18 cases, 7 years.

Prices.—15 cents, 1; 22 cents, 1; 25 cents, 1; 25 to 40 cents, 1; 30 cents, 2; 38 to 45 cents, 1; 42 cents, 1; 44 cents, 1; 45 cents, 1; 50 cents, 2; 60 cents, 1; 65 cents, 1; 70 cents, 1; 70 to 80 cents, 1; 75 cents, 1; 80 cents, 1. Average of 18 cases, 42 cents, nearly.

RED OAK.

Durability.—2 years, 1; 2½ years, 1; 3 years, 1; 4 years, 3; 6 years, 3; 7 years, 1; 10 years, 1. Average of 11 cases, 5 years nearly.

Prices.—15 cents, 1; 16 cents, 1; 17 cents, 1; 18 cents, 1; 20 cents, 1; 25 cents, 1; 30 cents, 1; 35 cents, 1; 37 cents, 2; 45 cents, 1; 50 cents, 3; 55 cents, 1. Average of 15 cases, 27 cents, nearly.

CHESTNUT OAK.

Durability.—5 to 7 years, 1; 6 years, 3; 6 to 8 years, 1; 7 years, 4; 8 to 10 years, 1 10 years, 1. Average of 11 cases, 7.1 years.

Prices.—15 cents, 1; 25 cents, 1; 25 to 30 cents, 1; 30 cents, 1; 30 to 50 cents, 1; 35 cents, 4; 38 cents, 1; 40 cents, 1; 45 to 50 cents, 1; 60 cents, 1. Average of 13 cases, 28 cents, nearly.

BLACK OAK.

Durability.—2 years, 2; 2 to 4 years, 1; 4 to 5 years, 1; 5 years, 1; 6 years, 2; 7 years, 2. Average of 8 cases, 4½ years.

Prices.—16 to 20 cents, 1; 20 cents, 1; 22 cents, 1; 25 cents, 1; 35 cents, 1; 50 cents, 2; 53 cents, 1; 60 cents, 1; 61 cents, 1; 80 cents, 1. Average of 11 cases, 43 cents.

YELLOW OAK.

Durability.—7 years, 1; 8 years, 1; 8 to 10 years, 1. Average of 3 cases, 8 years.

Prices.—20 cents, 2; 25 cents, 1; 38 to 45 cents, 1. Average of 4 cases, 27 cents, nearly.

JACK OAK.

Durability.—1 of 3 and 1 of 8 years.

Prices.—20 and 35 cents.

PIN OAK.

Durability.—4 and 8 years.

Prices.—20 cents and (2) 35 cents.

SWAMP OAK.

Price.—1 of 25 cents.

BASTARD OAK.

Durability.—1 of 4 years.

PINE (NOT SPECIFIED AS TO KIND).

Durability.—2 years, 1; 3 years, 1; 3 to 5 years, 1; 3 to 7 years, 1; 4 years, 1; 5 years, 1; 5½ years, 2; 6 years, 3; 7 years, 2. Average of 13 cases, 5.1 years.

Prices.—25 cents, 2; 28 cents, 1; 30 cents, 4; 35 cents, 3; 40 cents, 1; 40 to 5 cents, 1; 41 cents, 1; 45 to 55 cents, 1; 60 cents, 1; 75 cents, 1. Average of 11 cases, 36.4 cents.

LONG-LEAF, OR SOUTHERN YELLOW PINE.

Durability.—5 years, 5; 5 to 7 years, 1; 6 years, 6; 6 to 8 years, 1; 7 years, 4; 7½ years, 1; 8 years, 2; 9 years, 1; 10 years, 1. Average of 22 cases, 6½ years.

Prices.—18 cents, 1; 22 cents, 3; 22½ cents, 1; 25 cents, 5; 25 to 30 cents, 2; 29 cents, 1; 40 cents, 1; 45 cents, 1; 55 cents, 1; 67½ cents, 1; 77 cents, 1; 90 cents, 1. Average of 19 cases, 37 cents, nearly.

CALIFORNIA PINES (VARIOUS).

Durability.—5 years, 1; 6 to 9 years, 3; 7 years, 1; 8 years, 1. Average of 6 cases, 7 years.

Prices.—32 to 40 cents, 4; 35 cents, 1; 45 cents, 1; 65 cents, 1. Average of 7 cases, 41.3 cents.

WHITE PINE.

Durability.—5 years, 1; 5 to 7 years, 1; 7 years, 2; 8 years, 1. Average of 5 cases, 6.6 years.

Prices.—22 cents, 1; 25 cents, 2; 50 cents, 1. Average of 4 cases, 31¼ cents.

RED OR NORWAY PINE.

Durability.—4 years, 1; 8 years, 1. Average, 6 years.

Prices.—20 cents, 1; 25 cents, 1; 50 cents, 1. Average, 31.6 cents.

JACK PINE.

Durability.—5 years, 1.

Price.—25 cents, 1.

PITCH PINE.

Durability.—10 years.

Price.—25 cents.

FLORIDA PITCH PINE.

Durability.—5 years.

Price.—15 cents.

SPRUCE PINE.

Durability.—5 years, 1.

Prices.—30 to 40 cents, 1; 48 cents, 1.

SHORT-LEAVED PINE (CREOSOTED).

Price.—$1.15.

CHESTNUT.

Durability.—4 to 6 years, 1; 5 years, 7; 5 to 7 years, 1; 5 to 8 years, 1; 6 years, 15; 6 to 9 years, 1; 6½ years, 1; 7 years, 12; 7 to 8 years, 1; 8 years, 20; 9 years, 3; 10 years, 4; 10 to 12 years, 1; 11½ years, 1; 12 years, 1. Average of 70 cases, 7.3 years.

Prices.—17 cents, 1; 20 cents, 2; 22 cents, 1; 25 cents, 4; 26 cents, 1; 30 cents, 3; 30 to 32 cents, 1; 30 to 35 cents, 1; 30 to 40 cents, 1; 35 cents, 12; 38 cents, 2; 38 to 45 cents, 1; 40 cents, 12; 40 to 50 cents, 1; 41 cents, 2; 42 cents, 3; 44 cents, 1; 45 cents, 10; 48 cents, 2; 50 cents, 11; 50 to 60 cents, 1; 50 to 65 cents, 1; 51 cents, 1; 55 cents, 3; 55 to 60 cents, 1; 60 cents, 3; 61 cents, 1; 62 cents, 1; 63 cents, 1; 65 cents, 1; 70 cents, 1. Average of 87 cases, 42½ cents, nearly.

HEMLOCK.

Durability.—2 to 4 years, 1; 3 years, 1; 3½ years, 1; 3 to 7 years, 1; 4 years, 10; 4 to 5 years, 1; 5 years, 19; 5½ years, 1; 6 years, 11; 6 to 7 years, 1; 7 years, 5; 7 to 8 years, 1; 8 years, 3.

Prices.—14 cents, 1; 15 cents, 3; 15 to 25 cents, 1; 17 cents, 2; 18 cents, 5; 19 cents, 1; 20 cents, 7; 20 to 25 cents, 1; 22 cents, 4; 24 cents, 1; 25 cents, 13; 26 cents, 1; 26½ cents, 1; 28 cents, 1; 29 cents, 1; 30 cents, 10; 35 cents, 2; 40 to 50 cents, 1; 45 cents, 2; 48 cents, 1. Average of 59 cases, 25 cents, nearly.

CEDAR (NOT SPECIFIED AS TO KIND).

Durability.—4 to 6 years, 1; 5 years, 2; 6 years, 4; 6 to 8 years, 1; 7 years, 1; 7 to 9 years, 1; 8 years, 7; 8 to 10 years, 1; 9 years, 3; 10 years, 6; 10 to 15 years, 1; 12 years, 4; 14 years, 1; 15 years, 1; 15 to 20 years, 1. Average of 35 cases, 11.8 years.

Prices.—10 cents, 1; 20 cents, 3; 20 to 25 cents, 1; 22 cents, 2; 25 cents, 3; 28 cents, 1; 30 cents, 2; 30 to 35 cents, 1; 31 cents, 3; 33 cents, 5; 35 cents, 9; 36 cents, 2; 38 cents, 1; 40 cents, 2; 45 cents, 1; 50 cents, 5; 53 cents, 2; 60 cents, 1; 70 cents, 1. Average of 46 cases, 34 cents.

WHITE CEDAR.

Durability.—4 years, 1; 6 years, 1; 7 years 4; 8 years, 1; 8 to 10 years, 1. Average of 7 cases, 7.8 years.
Prices.—16 cents. 1; 25 cents, 1; 35 cents, 1; 40 cents, 3; 44 cents, 1; 45 cents, 2; 50 cents, 1. Average of 10 cases, 38 cents.

RED CEDAR.

Durability.—10 years, 7.
Price.—80 cents, 1.

TAMARACK.

(Hackmatack, "Juniper," in Northern New England.)

Durability.—4 to 6 years, 1; 5 years, 4; 5 to 8 years, 1: 6 years, 3; 6 to 7 years, 1; 7 years, 5; 8 years, 5; 8 to 10 years, 1; 10 years, 3; 10 to 12 years, 1. Average of 25 cases, 7.2 years.
Prices.—10 cents, 1; 17 cents, 1; 17½ cents, 1; 20 cents, 3; 20 to 25 cents, 1; 21 cents, 1; 24 cents, 1; 25 cents, 8; 26½ cents, 1; 30 cents, 1; 35 cents, 2; 38 cents, 1; 45 cents, 1; 60 cents, 1. Average of 24 cases, 27 cents.

CYPRESS.

Durability.—4 to 5 years, 1; 5 to 8 years, 1; 6 years, 2; 7 years, 3; 7 to 8 years, 1; 8 years, 4; 8 to 10 years, 1; 10 years, 11; 10 to 12 years, 1; 12 years, 1. Average of 26 cases, 8.7 years.
Prices.—11 cents, 1; 16 to 20 cents, 1; 20 cents, 1; 25 cents, 1; 28 cents, 1; 30 cents, 3; 35 cents, 1; 35 to 50 cents, 1; 38 cents, 1: 40 cents, 2; 45 cents, 6; 50 cents, 1; 55 cents, 1; 60 cents, 1: 65 cents, 1; 85 cents, 1. Average of 24 cases, 39.4 cents.

ELM (NOT SPECIFIED AS TO KIND).

Durability.—4 years, 1; 5 years, 1.
Price.—30 cents, 1.

RED ELM.

Durability.—4 to 5 years, 1; 5 years, 2; 6 years, 2; 7 years, 1; 8 years, 1; 9 years, 1. Average of 8 cases, 6.2 years.
Prices.—20 to 30 cents, 1; 25 cents, 1; 30 cents, 1; 35 cents, 2; 40 cents, 2; 45 cents, 1; 50 cents, 3. Average of 11 cases, 39 cents, nearly.

ROCK ELM.

Durability.—5 years, 1; 6 years, 2; 7 years, 1; 8 years, 1. Average of 5 cases, 6.9 years.
Prices.—20 cents, 1; 25 cents, 3; 35 cents, 1; 60 cents, 1. Average of 6 cases, 31.6 cents.

SWAMP ELM.

Durability.—5 years, 1.
Price.—25 cents, 1.

ASH.

Durability.—3 years, 1; 7 years, 2. Average, 5.6 years.
Prices.—11 cents, 1; 22 cents, 1; 30 cents, 1. Average, 31 cents.

BLACK ASH.

Durability.—2 years, 1; 4 years, 3; 5 years, 1. Average of 5 cases, 3.8 years.
Prices.—12½ cents, 1; 15 cents, 1; 22 cents, 1; 25 cents, 2; 30 cents, 1; 37 cents, 1; 50 cents, 1. Average of 8 cases, 27 cents.

WHITE ASH.

Durability. —4 years, 2; 5 years, 1. Average, 4.3 years.
Prices.—25 cents, in 2 cases; 50 cents in 1 case.

CHERRY.

Durability.—6 years, 1; 8 years, 1. Average, 7 years.
Prices.—25 cents, 1; 30 cents, 1; 40 cents, 2. Average, 34 cents.

RED CHERRY.

Durability.—6 years if hewn, 5 if sawn, 1; 7 years, 1; 8 years, 1.
Prices.—36½ cents, 1; 40 cents, 1; 47 cents, 1.

WILD CHERRY.

Durability.—7 years, 2.
Prices.—25 to 45 cents, 1; 46 cents, 1; 50 cents, 1.

BLACK CHERRY.

Durability.—10 years, 1.
Price.—50 cents, 1.

BLACK WALNUT.

Durability.—6 years if hewn, 5 if sawn, 1; 7 years, 6; 8 years, 1; 9 years, 1. Average of 9 cases, 7.1 years.
Prices.—20 cents, 1; 25 cents, 1; 25 to 45 cents, 1; 36½ cents, 1; 38 cents, 1; 40 cents, 1; 47 cents, 1; 50 cents, 2. Average of 9 cases, 38 cents.

WALNUT.

Durability.—4 to 5 years.
Price.—16 to 20 cents.

FIRS.

(California; various species.)

Durability.—5 years, 1; 6 years, 1; 6 to 9 years, 2; 8 years, 2. Average of 6 cases, 7 years.
Prices.—20 cents, 2; 32 to 40 cents, 2; 45 cents, 1; 65 cents, 1. Average of 6 cases, 37 cents.

SPRUCE.

Durability.—3 years, 1; 5 years, 2; 6 years, 1. Average, 6.3 years.
Prices.—10 cents, 1; 18 cents, 2; 25 cents, 2; 40 cents, 1; 50 cents, 1; 60 cents, 1. Average of 8 cases, 30.7 cents.

BEECH.

Durability.—3 years, 1; 4 years, 1; 5 years, 2; 7 years, 1. Average of 5 cases, 4.8 years.
Prices.—17 cents, 1; 18 cents, 2; 25 cents, 1; 30 cents, 2. Average of 6 cases, 27 cents.

LOCUST.

Durability.—5 years if sawn, 6 if hewn, 1; 6 to 8 years, 1; 7 years, 2; 8 years, 1. Average of 5 cases, 7 years, nearly.
Prices.—20 cents, 1; 25 to 30 cents, 1; 35 to 50 cents, 1; 38 cents, 1; 40 cents, 1. Average of 5 cases, 37.6 cents.

REDWOOD.

Durability.—8 years, 1; 9 years, 1; 10 years, 1; 14 years, 1; 15 years, 1. Average of 5 cases, 11.2 years.
Prices.—30 cents, 1; 37½ cents, 1; 40 cents, 2; 53 cents, 1. Average of 5 cases, 40 cents.

MAPLE.

Durability.—(Hard) 4 years, 1.
Price.—30 cents, 1.

(Without specification.)

Durability.—3 years, 1; 7 years, 1.
Prices.—25 cents and 30 cents.

(Soft.)

Durability.—4 years, 1; 4 to 5 years, 1.
Prices.—20 and 25 cents.

BUTTERNUT.

Durability.—5 years if sawn, 6 years if hewn, 1; 6 years, 1; 6½ years, 1; 7 years, 2. Average of 5 cases, 6.4 years.
Prices.—15 cents, 1; 25 cents, 1; 40 cents, 1; 45 cents, 2; 50 cents, 1. Average of 6 cases, 36.6 cents.

COFFEE-NUT.

Durability.—7 years, 1; 10 years, 1.
Prices.—36½ cents, 1; 50 cents, 1.

MULBERRY.

Durability.—5 years if sawn, 6 if hewn, 1; 6 years, 1.
Prices.—22 cents, 1; 40 cents, 1.

MESQUITE.

Durability.—6 years, 1; "indestructible," 1.
Prices.—62½ cents and 75 cents each, 1.

BIRCH.

Durability.—5 years, 1.
Price.—20 cents, 1.

COTTONWOOD.

Durability.—5 years, 1.
Price.—25 cents, 1.

HONEY LOCUST.

Durability.—10 years, 1.
Price.—50 cents, 1.

OSAGE ORANGE.

Price.—In 1 case, $1.15.

SASSAFRAS.

Durability.—7 years, 1.
Price.—20 cents, 1.

REMARKS.

1. Ties chiefly come from Saratoga and Warren Counties, New York, on the line of the road; are cut mostly in winter; no seasoning; hewn preferred, and trees that make but one tie to a length.

2. From Birmingham north, the ties are chiefly got from the mountains; south of that place they are cut on wet lands. Pines from forests between Birmingham and Tuscaloosa; cut principally between September 15 and March 1; hewn ties preferred; sawed ties check badly. They are best when one tie is made from a length. They should not be cut through the heart of the tree. About 30 miles of this road is located through a rotten limestone soil, in which ties and pile-timbers decay quicker than on other portions of the road.

3. Ties received from both divisions of the Allegheny Valley Railroad. They are cut from October to March; no preserving processes employed more than laying them on stone ballast, with good drainage-boxes where necessary; ditches are kept open and clean. Hewn ties preferred, making one tie to a cut.

4. Ties come from along the line of road, and are cut in autumn and winter; no preparation or preserving process employed; hewn preferred, and from trees that make but one to a length.

5. Cypress comes from the swamp, white oak and post oak from the ridges, and overcup oak from the river bottoms, within 5 miles of the road; cutting done in January, February, July, August, September and October; no preparation, but allowing them to season in the open air about three months before using; sawed ties preferred, but they are more costly. Cypress ties should only be sawed from large trees; post oak and white oak ties from small trees are equally as good as from large ones.

6. Ties supplied mostly from Ashburnham and Westminster, Mass.; some come from Enfield and that vicinity, where large quantities of chestnut are growing. Hewn ties preferred when they can be procured, as they appear not to soak water as quickly as those that are sawn; prefer small timbers that will make a 6-inch face rather than those sawn from large trees, as they are not as brittle. No experiments have been made upon durability.

"We are now taking out ties that have been in the ground about eight or nine years and are putting in new ones. Think a hewn tie will last from one to two years longer than a sawed one, for the reason that hewing shuts up the pores, whereas sawing leaves them open, and not so smooth on the face. You will notice the pines vary, No. 1 being 6-inch face and over, and No. 2 being under 6 inches."

7. Ties supplied from along the line of road, and are cut in winter. As there is usually a large stock on hand they are allowed to lay in piles for one year. Prefer hewn ties, and from trees that make one tie.

8. Oak ties are from Missouri; cedar from Wisconsin and Michigan; pine from Colorado and New Mexico. One lot of pine ties were placed in water for two months or more before being placed in the track, with the result of increasing their durability to a considerable extent. Pine ties cut in summer and placed in track while green last three years. If cut in winter, and seasoned before use, they last about five years; and if cut in winter and water-seasoned, they will last five and a half years. Have some experiments in progress to test the value of chemical treatment of ties with chloride of zinc, by the Saint Louis Wood Preserving Company's process. An examination at the end of one year showed very favorable results. With respect to hewn or sawn ties, have no preference, so far as durability is concerned. Prefer young and growing timber, as being more durable than that which has stopped growing, or which has reached or passed its maximum vitality. Small trees, as a rule, are better than very large ones. This system of roads, being of recent construction, does not as yet furnish certain information in regard to the durability of cross-ties. Our experience with oak ties in Kansas is of sufficient length to enable us to state the average life of such ties in this climate with considerable accuracy. The cedar ties have only been in use four years, which does not enable us to say how long they will last. Our experience with pine ties is not sufficient to answer as to their durability with entire certainty, and the reply is given in accordance with the apparent evidence of present experience. No rule could be followed in respect to the time of cutting, and it was not possible to adhere to the terms of the contracts, which required the cutting to be done between the 1st of November and the 1st of February. As a matter of fact, the oak ties, from which the data were taken for determining their durability were, for the greater part, cut in spring and summer, and laid in the track while green.

9. The ties of this road are from the Zuni Mountains of New Mexico and the Colorado Plateau of Arizona, and were cut at all seasons. The preference is for hewn ties, and no others are used.

10. Supplies of ties come from Maine and New Hampshire, and they are cut in winter, from October to April. They are not seasoned or otherwise prepared, and no preserving processes have been used. They can be purchased too cheaply to make it profitable to employ any preserving process. Prefer hewn ties, and from small trees. Ties sawn from large hemlocks would be comparatively useless.

11. Ties come from the country adjacent to the road, and are cut from December 1 to March 1. They are all hewn, and from trees that make but one tie to a cut. From the division between Bellaire and Columbus, it is remarked that ties should be cut from young, thrifty timbers, and not to exceed four ties to a cut.

12. Ties got from along the line of road, and cut in winter; young, thrifty trees required for good ties.

13. Ties had from along line of road, and cut in autumn and winter. Hewn preferred, and from trees that make but one tie to a cut.

14. Ties obtained from Piscataquis County, Maine, and cut in winter. They are usually put in the track when about half seasoned, but it is thought that full seasoning would be better. Prefer sawn ties, and from large trees.

15. Ties obtained from within three miles of the line of road, and cut in winter. No preparation beyond simply seasoning. Prefer hewn ties, unless sawn from small trees, which are considered better, as holding spikes more firmly. Upon this road, in common with all others of this region, the ties are bought in winter and spring, from the farmers adjacent and within five miles. They are mostly cut and hewn in winter, and those from large logs are sawn during the winter and spring from trees cut in winter and drawn in on the snow. In order of preference we may name the white oak, rock oak, yellow oak, and red or black oak, the last two being much inferior to either of the others. Hemlock, chestnut, red beech, black cherry and black ash are used to some extent, but with the exception of chestnut are not valued. The chestnut may be valued at about two-thirds the value of oak, and hemlock at half. As they are comparatively cheap no experiments have been made in preserving processes, and no planting has been done, as timber lands are being cleared, furnishing all the ties needed.

16. Ties obtained from swamps on the road, between Port Allen and Rosendale, and are purchased in autumn. They are deadened in autumn, cut and floated in the following spring, and hewn the following autumn. Hewn preferred, and large trees all heart instead of sap. Cypress timber is most durable of all, especially in damp climates.

17. Ties come from all along the line of road; they are cut without regard to season and stacked. Hewn preferred, and from trees tha make but one tie. No experience in preserving processes and no planting.

18. Ties taken from Blair, Cambria and Clearfield counties, along the line of the road,

and cut in winter and spring. Hewn preferred, and from trees that make but one tie to a length.

19. Hewn ties preferred, and deemed more durable; young trees that make but one tie to a cut are preferred.

20. Supplies derived from the country adjacent to the road and cut in winter; seldom any preparations, the ties being used in the spring after they are cut. Use sawn ties and from trees that make one tie from a length. From 35 to 40 years would be required to grow a new crop of trees to a size large enough for ties.

21. Prefer ties hewn smooth and one to a cut.

22. Supplies derived from Canada, Maine and New Brunswick, and ties cut from November to April. The ties are seasoned in the open air without other preparation and hewn from trees that make but one tie to a length.

23. Ties come from Worcester County, Massachusetts, and are cut in winter. Hewn preferred and those from trees that are young.

24. Supplies are from Maine, and cut at all seasons, but mostly in autumn and spring. The ties are usually piled about six months before being put in the track. A hewn tie is preferable, and from trees that make but one from a cut, except when the heart of an old and large tree can be got.

25. Ties obtained from Virginia and New Brunswick, and are cut in spring and winter. Hewn preferred, but no preference between large or small trees.

26. Ties obtained from Pennsylvania, and cut in March, April, May, and June. Hewn preferred, and ties that make but one to a cut are found to last longer.

27. Chestnut ties are procured on Long Island and in New Jersey. Ties are generally cut in winter, and hewn are much preferred. Those that make but one to a cut are most durable.

28. Ties obtained in Forest, Warren and Venango Counties, on the line of the Allegheny River, and in Venango and Crawford Counties on the line of road. They are cut in fall and winter, and are both sawn and hewed. No kind of timber used except second growth.

30. Cedar ties come from Wisconsin, and all others from the country adjacent. Generally cut in winter. Prefer hewn ties, because they do not absorb moisture so readily as those that are sawed, and they average a larger size. Small timber preferred, because it is more apt to be sound.

31. Ties obtained along the line of road, and mostly cut in the winter months. Hewn preferred to sawn, and from trees that make but one to a cut.

32. White oak and chestnut for ties, obtained in Delaware, Maryland and Virginia, and spruce pine from Virginia. No particular season for cutting is required, and no preparation is employed. Hewn ties are used, and those that make but one to a cut are preferred.

33. Ties obtained from the country along the line, and cut at all seasons of the year. They are hewn in every case, and those that make but one tie to a tree are preferred.

34. Supplies are derived from the line of the road. Oak ties on the western division and pine and cypress on the eastern. They are cut at all seasons, but those cut in winter are best. Hewn ties preferred always, and no preference is observed as to large or small trees.

35. Ties obtained along the line and are cut chiefly when the bark will peel. No preparation by seasoning except piling. Hewn preferred, and the best ties are from trees that make but one tie to a length.

36. Redwood is obtained from the west coast near San Francisco; pine and fir from the Sierra Nevada Mountains. The redwood is cut at all seasons, the pine and fir in the winter months. The redwood is preferred split, the other timbers sawn, and all from large trees.

37. Ties from along the line of road, and cut at any season. They are hewn, and those from small trees preferred.

38. Oak comes from Iowa and Missouri; cedar from Michigan. Ties cut in winter; hewn, and preferred from small trees that make but one to a cut.

39. Ties had from province of Quebec, and chiefly cut in fall and winter. Hewn ties from small trees preferred.

40. Pine obtained between Augusta and Columbia, and oak between Charlotte and Statesville. The ties are hewn, and cut between late in fall and early in spring trees preferred.

41. Ties obtained from Adirondack wilderness in winter. They are hewn, and small trees preferred.

42. Ties had from along the line of road, and generally cut in winter. Hewn ties probably last longer, but sawed ones not objected to. No comparative experiments have been made with reference to large or small timber. It is observed that pine trees which have been "bled" for turpentine do not make as durable timber as "sound trees," or trees that have not been "bled." The difference is very perceptible, but the percentage of durability is not known.

43. Ties obtained between Richmond and Huntington on the line of road, and are

cut during the fall and winter months. They are hewn, and trees are preferred that make but one tie to a cut.

44. Ties mostly come from Putnam and Sullivan Counties, Missouri, along the line of the road, and are generally cut in the winter season. Prefer hewn ties, as the hewing more closely follows the grain, but above all, the quality of timber. A hewn tie has to be from small-sized and generally thrifty timber, and small trees are preferred by all means. Sawed ties made from large and old timber are generally not so lasting. No experiments have been made in planting, because timber is too plenty. About 250 to 300 ties are obtained from an acre.

45. Ties obtained in Western Indiana, between Danville and Terre Haute, and are cut in winter and hewn. Small trees preferred.

46. Ties are obtained along the line of railway, the greater portion between Lapeer and Lansing, Mich. Some cedar comes from the east shore of Lake Huron and west shore of Lake Michigan. They are cut during the whole year. Hewn preferred, but a large quantity of sawn oak has been used, where too large to hew. Small trees of second growth are tougher and better. As yet this company has had no opportunity for experimenting on the durability of ties, since the line has been in possession but for a little over three years. The average durability is reported from previous experiments upon other roads. There is no doubt, however, but that any quality of timber used for ties will last longer in heavy ballast or cut stone than in sand or earth. No experiments have been heard of in the way of planting, but it will soon have to be done, as large quantities are cut annually, particularly of oak, for car-building. About 125 ties on an average are cut from an acre of land, although as many as 175 have been taken off where heavily timbered. The oak grown on soft, swampy land is found to be tougher and to last longer than oak grown on high land. With hemlock and tamarack it is found to be just the reverse, the high-land growth being preferred. During the year this company has sold about 140,000 oak and about 65,000 soft wood ties.

47. Ties are from Michigan, and cut in January. Hewn ties are preferred for cross-ties, and sawn for switches. Those are best that make but one tie to a cut.

48. This line is entirely new, and it is impossible to give any results in the matter of the life of ties, &c. The supplies were from Eastern, Central, and Southern Illinois, and from Western Michigan. Ties are hewn.

49. Ties obtained along the line of road, and generally cut in winter and hewn, small trees being preferred that make but one tie to a cut.

50. Ties come from Middle and Southern Illinois, except cedar, which is from Michigan. They are cut during the whole year, but mostly in winter. Seasoned ties are thought to be more lasting than when laid green. In 1869 some 15,000 hemlock ties were treated with creosote, the liquid penetrating only about half an inch, the timber being green. This did not appear to prolong their durability, as they decayed at the center. Hewn ties preferred, especially if from young timber, and those that make but one to a length look best, but they are not thought to last longer than those from large timber, if sound. Oak will grow to size for single ties in 25 to 30 years; black walnut in 15 to 18 years; black locust in 15 years, and wild cherry in 20 years.

51. Ties are from Turkey River and the Mississippi Valley and cut in winter. Hewn ties preferred, and from trees that make but one tie to a length.

52. Ties come from line of road; cut at all seasons, hewn, and from small trees.

53. Supplies obtained from Northwestern Wisconsin, and cut mostly in winter. Sawed ties preferred, having the same amount of timber as hewed, and quality being equal; those best that make but one tie to a cut. No experiments have been made for testing durability beyond the observation of trackmen. The ballast of this road is gravel. As to the number of ties to be got from an acre, no exact account has been taken, but it would probably be about as follows: Oak or rock elm, 250 to 300 per acre; tamarack, 250 to 300 per acre; white pine, 350 to 400 per acre, and Norway pine and hemlock the same.

54. Ties principally got along the line of road and during the fall. They are sawed, and small timber of good solid growth is best.

55. Ties obtained from Indiana and Ohio. Hewn preferred, and from large timber.

56. Ties come from timber lands along the line of road. They are cut from December to July, and hewn. The difference, as compared with sawed ties, is three years. Those from trees that make but one tie to a cut are preferable.

57. Ties obtained on the line between Danville, Ky., and Chattanooga, Tenn., and are cut from July to February, inclusive. They are allowed to season in stacks for several months before using, and are hewn. Those are preferred that make either one or four ties to a cut.

58. Ties taken from along the line of road, and cut at no specified time. They are hewn, and preferred from small trees. Tracks ballasted with gravel, and ties last much longer in this than in soil.

59. Ties obtained in Dallas, Hale and Perry Counties, Alabama, and cut in January,

February, March, and April. No preference is given to hewn or sawed. Small timber not so large-grained as big timber.

60. Ties taken from lands adjacent to road. Sawed ties used only on bridges and trestles, and those from small trees preferred.

61. Ties obtained from along the line of road, and cut at all seasons. Hewn ties preferred, made from trees that furnish but one to a cut. No experiments have been made, but observation leads to the belief that ballast of gravel or stone is preferable to sand or other material. Ties grown upon clay soil last longer than those from sand or gravel. A difference of from one to three years is found in the durability of ties grown in different localities.

63. Ties come from along the line of road. Contracted in December for delivery by the following July. Hewn preferred, and those from small trees hewn on two parallel sides.

64. Ties are from Summit, Wayne, Holmes, Knox, Delaware, and Franklin Counties, Ohio. They are cut from September to March, and seasoned by piling, so as to allow a free circulation of air. Hewn ties preferable, as the timber is usually better. Small trees preferred. No experiments have been made, further than to observe the life of ties. Have always found that ties last longer under a good, smooth rail than one badly ballasted, and consequently longer under steel rails than those of iron. It is estimated that there is a difference of eighteen months between them. There is more repairing of iron, drawing and driving of spikes, &c., which cut and wear the ties. The surface of the rail being smoother, there is less cutting and wearing and less jar. The durability of all ties has been prolonged by inserting wooden plugs $\frac{1}{2} \times \frac{1}{2} \times 5$ inches in size into the holes where spikes have been drawn, so as to exclude the water and give a better hold for the spikes. There have been considerable differences of opinion expressed relative to the durability of ties laid in furnace slag as ballast in regions where pig-iron is manufactured, some insisting that ties will last as many as four years longer in such ballast, while others claim that they will not last as long as on gravel or broken stone From experience had on the New York, Pennsylvania and Ohio Railroad it was found that ties laid six years on slag ballast showed no difference in wear as compared with the same class of ties laid in gravel. Further observations of this portion of road would test the question of durability of slag ballast.

65. Ties come from West Virginia, and hewn, preference being given to those making one to a cut.

66. Ties obtained from along the line of road in Ohio, and cut in winter. They are hewn, and preferred from small trees.

67. Ties taken from along the road, and cut from July 15 to December 1. They are generally piled for a few months before using, and are hewn; small white oak timber being the best. It is noticed that timber grown on the poorer hills is much more durable than that from rich bottom lands. Catalpa can be easily grown in the region of this road, and affords a most durable material for cross-ties.

68. Ties grown along the road, and usually cut in winter for laying the following summer. They are hewn, and those from small trees preferred.

69. Ties come from Kentucky and Ohio, and hewn, small trees, making one to a cut, being preferred.

70. Ties taken from the northwestern part of South Carolina. White, post, or chestnut oak ties are to be cut between the 15th of November and 15th of February, or 15th of June to 15th of September. No time is specified for pine trees. No preference shown for hewn or sawed timber, but small trees preferred.

71. Supplies from Indiana, and hewn ties preferred.

72. Ties come from along the line of road and from Great Kanawha River district. They are cut at all seasons, and hewn, small trees being preferred.

73. Chestnut and hemlock are obtained along the line of road; cedar from Canada and New Brunswick. Ties are cut in fall and winter, and hewn, but no difference is made in price between those hewn and sawed. Those made from small trees are the best.

74. Ties obtained along the line of road, and cut in winter. They usually are allowed to lie a year in piles. Hewn preferred, also those from small trees.

75. Ties had from along the line of road, and hewn, those making but one to a length being preferred.

76. Ties had from line of road, and cut in winter. Small trees preferred.

77. Ties come from Virginia, and should be cut from August to March. They should season six months if cut in August, and nine months if cut at other seasons. Hewn ties last from two to three years longer than those that are sawed. Trees are preferred that will make from three to five ties. A great deal depends upon the material of the road-bed with respect to the time that ties will last. A sand, gravel, or stone ballast will last longer than clay, and the better the road-bed is drained the longer the ties will last. There is no timber along the line of this road fit for ties but sap pine. It will grow to a size fit for ties in forty years, but will not last as long as spruce from Virginia.

78. Ties had from along the line of road, and cut between November and March. Sawed ties from thrifty timber are considered best, because of uniform dimensions. Timber that will make but one tie to a length is preferred as being more durable, as a rule. Rock or chestnut oak is peeled for tan-bark in spring and made into ties the following winter. No careful experiments have been made in the durability of cross-ties, but from fifteen years' experience the writer is satisfied that cross ties supported in stone ballast have twenty per cent. longer life. Chestnut or rock oak grown on dry and rocky mountain ridges is of very inferior quality, being brash and nearly always showing dry rot in spots when cut down. The same is true to less extent with white oak. Thrifty rock-oak, grown in hollows, where the soil is better and moisture abundant, equals the best white oak in endurance. Chestnut in this region lasts well on the ground, but it is too soft to stand consolidated engine weight; it does not hold spikes in place on curves, and is rejected on this account.

79. Ties obtained along the line of the Cumberland Valley Railroad, in Pennsylvania, and some from the Shenandoah Valley, Virginia. White oak is cut in winter and rock oak in May. Ties hewn, and none will be taken if sawed that are square. They must be from young trees, and flat on two sides, with the bark off. The ties are all laid on broken-stone ballast. The proportion of rock oak is about 30 per cent. These ties are made from timber that has been cut in May, stripped of the bark for tanning, and then hewn during the season. The white oak ties are made in winter, and the bark is taken off when made. The white-oak that grows in the valleys upon limestone land is better than the same kind of timber grown on the mountains.

80. Ties had from along the line of road, and cut at all seasons, but mostly in winter. They are seasoned about one year. Both sawed and hewn ties are used, but the latter are greatly preferred. For second growth chestnut or oak; one from a cut is good size. Excellent gravel is used for ballast, and ties on a track kept thoroughly drained can be made to last ten years. Timber is getting scarce in this section, but sufficient remains for several years without going far from home.

81. Ties procured along the line of road, and cut in fall and winter. Prefer hewn ties, and those that are from trees making but one to a cut. It is thought that ties will last longer with broken stone as ballast, although careful experiments have not been made.

82. Ties procured from Maryland, Delaware and Virginia, and cut at all seasons. Hewn ties preferred, but no difference noticed between large and small timber Ties laid in gravel or sand ballast. The durability reported is only approximate.

83. Ties are obtained from the region bordering the valley of the Susquehanna in the counties of Otsego, Delaware, Chenango and Broome, for the Allegheny and Susquehanna Road, and from Saratoga, Washington and Warren counties for the Rensselaer and Saratoga road. Tamarack is from Canada. The ties are cut in winter, and generally used the next summer. There is no doubt but that ties seasoned for one year, being properly piled, and the bark taken off, would last longer than ties used the same year they are cut and the bark left on. Hewn preferred, and trees that are of a size to flatten to 6 inches thickness, with 6 to 8 inch face, are preferable. Ties seem to be less liable to rot when laid on stone ballast, but they show wear more perceptibly, being less elastic. The durability is therefore about the same on stone as on common gravel ballast.

84. The branch from Syracuse to Oswego has heretofore derived its ties from the line of the road, but for the last two years from Canada. They are cut in fall and winter, and are used the following summer. Hewn ties preferred, and those that make but one to a length.

85. Ties procured from Tennessee Pass, Marshall Pass, Monitou Park and San Juan, and are cut in winter and spring. They are hewn, and no large timber is used.

86. Ties come from Iowa, Minnesota and Missouri, and cut in winter. It is found that ties are stronger and more durable when seasoned, and the bark stripped off. Hewn ties are the best, since they are generally straight-grained, stronger, and less liable to absorb moisture on the sides than those from large trees, especially if crooked and sawed across the grain. Small timber is preferred, and especially second growth, if it can be procured.

87. Supplies come from the line of the road, in the middle of Michigan. Ties are cut in December, January and February, and hewn, because necessarily made from young trees that make but one tie to a cut.

88. Ties obtained from the line of road, and cut in winter. They are hewn, and made from trees that furnish but one to a cut.

89. Ties obtained near the line, and are cut from December to April. No difference is found between ties that are hewn or sawed, if made of similar timber. Small trees preferred.

90. Ties procured along the line of road, and are cut in winter. Hewn preferred, but if sawn, only on two faces, leaving the sides of the tie in their natural state.

91. Ties are from Clayton County, Iowa, and cut in the fall. Hewn preferred, and "pole-ties," or one tie to a length; those laid on natural soil. No experiments have

been made in planting. The native growth is limited to the margins of the streams, and is not adapted to this use, except in a very small degree.

92. Ties had from Warren County, Pennsylvania, and cut at no particular season of the year. Hewn ties from small trees preferred. Although no particular experiments have been made, it is thought that trees cut between December 1 and March 1, and peeled and thoroughly seasoned before use, would be preferable.

93. Ties got along the line of road. The proper time for cutting would be in winter, but large quantities of rock oak are cut in the spring for bark, and the smaller trees are made into ties. White oaks we cut in winter, when the sap is down. Hewn preferred to sawed, and small timber to large. It is found on this road that ties are much more durable when laid on broken-stone ballast, than when laid on the ground, but it has not been in operation long enough to test this matter thoroughly. The first ties were laid on the ground, and lasted five to six years. They have been raised as rapidly as possible on a thin coating of ballast. No planting has been done by this company.

94. Cedar ties are procured in the province of Quebec, hemlock and white pine from New Hampshire, and southern pine from Georgia. They are cut at all seasons, and generally seasoned from six to eight months. Kyanizing has been tried the last two years, but time has not been sufficient to give any results. Hewn ties last much longer than sawn. White pine ties are much better when cut from large timber, but hemlock from trees that make but one tie to a length.

95. Ties procured from along the line of railroad, and are usually cut in winter. Hewn ties last longer than sawed. Preference is given to trees that make but one tie to a cut. Experiments have been limited to the use of sand for ballast and of furnace slag. With slag ballast ties will last at least two years longer than where sand is used, as it permits of perfect drainage. No accurate accounts have been kept of the yield per acre. It would not probably exceed 50. Timber would grow sufficiently large for ties in twenty-five to thirty years.

96. Ties are obtained along the line, and cut all the year, but mostly in spring. Hewn ties from small trees preferred.

97. White oak is procured from East Tennessee and Northern Georgia; yellow pine from Alabama, Mississippi, and Southeastern Georgia. The ties are cut preferably in fall (October and November), and hewn. Those from small trees preferred. Ties on rock ballast will last eighteen months longer than on soil. Those in sandy soil decay sooner than in other kinds of soil.

98. Ties come from the Allegheny Mountains, and are hewn, those from small trees being the best.

99. Ties obtained from the line of road, and are cut in winter and hewn, but one tie being made from a length.

100. Ties are obtained from Virginia and North Carolina along the line of road east of the great Dismal Swamp. They are cut in spring and summer, and are not seasoned more than occurs from delays of construction. Hewn preferred, and those that make but one to a length.

101. Ties come from the mountainous regions of Kentucky and West Virginia, but principally from Carter, Rowan and Bath Counties, Kentucky. They are cut from August 1 to March, and stacked in piles of 50 for several months before being used. Hewn ties made from trees that afford but one tie to a length are preferred. Pole-ties admit of better tamping in the road-bed. This road is using three kinds of ballast—gravel, furnace-cinder, and broken rock. Cinder is preferred, as it holds the ties in place better and seems to preserve them to some extent. It furnishes perfect drainage, and as it is disagreeable to walk on, tramps and cattle keep off the track. Hard limestone comes next, and has been found much better for holding the ties in place and preserving them than sandstone or gravel. This being a moist climate with a heavy clay soil for the most part, ties do not last as long as in the North and West.

102. Ties obtained from within 5 miles of the line of road, and are generally cut in winter. Prefer hewn ties with the bark peeled off and those made from large trees, when sound and free from wind-shakes. Ballast with gravel. It would probably require twelve to fifteen years to grow a new crop of trees large enough to make ties of one to a cut. This company planted about 100,000 catalpa trees five years ago.

103. Ties cut in fall and winter and sawn from small trees.

104. Ties obtained along the line of road from East Saginaw to Ludington, in the central part of Michigan. They are cut from November 1 to May 1, and sawn. If from small timber they are merely slabbed on each side. Large timber is not got for ties, because the price paid would not get the best quality, and only the poorest would be made into ties.

105. Ties procured in the northern part of Wisconsin, the time of cutting being unknown, as they are furnished by timber dealers. Sawn ties are used. Experience has not been had as to durability or preference, as the road is only six years in operation.

106. Ties procured in Allen, Wells, Blackford, Delaware and Henry Counties, Indi-

ana, and are cut from December 1 to March 1. Hewn are preferred and used exclusively. "Pole-ties," so called, are much preferred, especially those made from white oak, which is the kind principally used.

107. Oak, chestnut and hemlock are procured along the line of road, and cedar from Canada. They should be cut when the sap is out of the wood, and are preferred hewn.

108. Ties obtained in Northern Michigan and Indiana, and are cut in fall and winter. They are piled about six months before using. Prefer hewn ties by all means, as they will not use as good timber for sawed ties. The trees should make but one tie.

109. Ties chiefly procured along the line of railway and brought down by railroad and rivers, and some from Lake Huron and the islands of Georgian Bay. They are cut from November to March. It matters not whether they be hewn or sawn so long as the upper and lower faces are flat and the sides uncut. Oak ties are taken when sawn on four faces, but no other kind. A tree should average four ties, the butt end being about 14 inches and the top end about 6 to 8 inches. The ties of this road are laid in gravel. It is found that sand ballast destroys ties more than the coarser kinds of ballast, which give greater drainage.

"Our contractors state that from twelve to fifteen years will yield a crop of trees of hemlock, *i. e.*, the original trees being cut young, second growth will come up in that time ready for tie purposes."

Cedar is found too soft for the main line, but is used on branches and for sidings. White-oak ties have become very scarce, their price being as high as 60 cents and upwards, but good white-oak ties can be counted on for ten years at least. Oak ties are procured from Southern Illinois; cedar from the borders of Lakes Michigan, Superior, and Huron. Ties are cut at all seasons, and are hewn, but there is no choice if the wood is sound.

110. Ties come from Chestnut Ridge Mountain, Fayette County, Pennsylvania, and are cut from November 1 to March 1. They are carried in stock four months for seasoning, and are hewn; small trees being preferred.

111. Ties obtained in Washington County, New York, and cut in winter. Hewn preferred, and from trees that make but one tie to a length.

112. Ties are procured along the line of road, and cut at all seasons. Hewn preferred, and those from trees that make but one tie to a length. They are found to last longest in stone ballast; next in coarse gravel; next in soil, and shortest time in cinder and sand ballast.

113. Ties obtained in Connecticut, in the part through which the line runs and are cut in winter. Those from small trees are best.

114. Supplies come chiefly from Eastern Texas. Some cypress ties have been got from Southwestern Louisiana, and long leaf pine ties have been partly obtained from Alabama and Florida. No time of cutting is stipulated, but preference is given for October, November, December and January. No attempt is made to season, except to put through the preserving process. This company has employed creosote, or dead oil, in preparing about 150,000 ties, but they have not been in use a sufficient length of time to give practical results. It has just begun to use the Burnettizing process upon the short leaf or loblolly pine of Southeastern Texas. Hewn ties preferred. Large timber sawn is preferable to young unmatured wood. No experiments have been made for testing the durability of ties by raising on ballast, the scarcity of good stone preventing. Post-oak forests have very thin and inferior quality of timber—rarely producing more than ten good ties to the acre. The long leaf ties of Eastern Texas will furnish 80 ties to the acre; short leaf pine forest 70 ties per acre. No information is had as to the length of time required for the growth of a new crop of trees to the size requisite for ties, nor of the effect of soil, &c., on the quality and durability of the timber.

115. Ties obtained from along the line of road, and are cut late in summer and in autumn. Hewn ties are preferred, except for bridges and switches, for which sawn ties are employed. The larger the trees the better the ties. The number of ties from an acre varies with the quality and quantity of forest growth, but well-timbered localities will yield from 300 to 400 ties to the acre

117. Ties come from Edgar County, Illinois, and Vigo and Clark Counties, Indiana. They are usually cut in winter.

118. Ties obtained near the line, from Longview to Spring, from Troupe to Mineola, and from Palestine to Rockdale. They are cut at all seasons, and hewn. Trees that make but one tie to a length are preferred.

119. Ties obtained from West Virginia, near the Ohio River, and are cut in winter. Hewn.

120. Ties are obtained from Eastern Iowa, and cut in winter. Hewn preferred, and those making but one to a length.

121. Cedar obtained from Canada, and all other kinds from the line of railroad in Cayuga and Tompkins Counties, New York. They are cut in winter and hewn, the trees being best that make but one tie to a cut. White oak ties are worth probably

more than 40 cents, but there are not many here, and what are bought are thrown in with the chestnut at 35 cents. If a small lot is offered, 40 cents are paid.

122. Ties are obtained from Clark, Scott, Jackson, Bartholomew, Jefferson and Jennings counties, Indiana, and cut from August 15 to March 1. They are allowed 60 days on an average for seasoning. No sawed ties are used, except for switches. Second growth trees, averaging 14 inches at the butt, are the best for ties.

123. Hewn ties preferred, and from trees that make but one tie to a length. The road is laid in stone ballast.

124. Supplies obtained from the country bordering the Osage River, Mo. The ties are cut from October 1 to April 1, and seldom seasoned more than six months before using. If made from large timber no preference is had between ties that are sawn or those hewn. Large timber is deemed best. No careful experiments have been made for testing the durability of ties. This company has an experimental forest plantation of about 640 acres, under the charge of Messrs. Robert Douglass & Sons, of Waukegan, Ill. In hewing ties from large trees, the logs are first rived, and unless the grain is straight, it will not pay to work the timber into ties. For this reason, the hewn ties are generally straight grained. In sawing, no attention is paid to the grain, and cross-grained ties are not as valuable as those with a straight grain, because not as strong, open to the weather, and liable to split when the spikes are driven into them. Between a straight grained sawn tie and the same hewn (both being from large timber), preference would be given to those that were sawn.

125. Ties obtained from Missouri, and hewn.

126. Ties come from Western and Central Missouri, and cut at all seasons. They are hewn, and made from large timber.

127. Ties are cut in March, April, May and June, and are hewn. Trees preferred that will make but one tie to a length, as they will last longer.

128. Ties had from the Southern part of Kentucky, and are cut in any months, except from February to June, inclusive. Hewn ties preferred, on account of their not being as liable to hold water. Young trees preferred.

130. Ties obtained from along the line of road, and are cut in fall and winter. For seasoning they are stacked with 6 inches of space between each tier, for six months. Hewn ties preferred, and from trees that make but one to a length.

131. Ties are procured in Indiana from within 5 miles of the line of road, and chiefly in Jay, Delaware, Madison, Tipton and Clinton Counties. They are cut at all seasons but about 70 per cent. in the winter months. Hewn ties preferred, and very generally used. Trees that make but one tie to a length are preferable to the large timber. A tree that will halve and make two ties is not objectionable. No experiments have been tried in the preservation or use of ties. They are generally delivered in small lots by a great number of farmers, who make the business subsidiary to their farming operations, and reliable data cannot well be obtained, as to the number obtained from an acre, the effects of soil, &c. No planting has been done, the native growth having been sufficient, and the clearing of the land the main object. It will be hard to educate without the experience of necessity, which is already being felt in many places, and the time is not far off when it will be generally so. In Illinois, the tendency to cultivate trees is great, and the possible results of a 20 and 30 year period, as shown by the experiments of these early times in a few isolated cases, tends to materially increase it. The depot grounds of the Illinois Central Railway, and courthouse yard at Boston, are good examples.

132. Oak is obtained from the immediate vicinity of the line of road. Cedar is brought from Northern Michigan. Ties are cut in winter. Those cut in a winter will be laid in the summer of the next year. As an experiment, 200,000 soft-wood ties were treated by the Thilmany process, but they have not been down long enough to determine the value of ties thus preserved. Hewn ties preferred. Those hewn on two sides, from small trees, generally termed "pole ties," are preferred.

133. Ties are obtained along the line of road, except those of cypress and cedar, which come from the South. They are cut at all seasons. Preference is given to hewn ties made from small, second-growth timber, that does not need to be sawn.

134. Ties made from adjoining timber, and cut in winter. Hewn ties preferred, of the kind known as "string ties."

135. Supplies procured in Gregg and Harrison Counties, Texas, and ties cut in winter. Preference is given to large timber, split and hewn. Experience shows that post, white and overcup oak last much better when cut, with the sap down and the heart up, as they hold the spikes better. But with red oak, those put down with the sap up were worn out in two years, while those with the sap down are in the track yet, and generally solid after four years of use. The ground seems to carry the sap off without damage, while if the sap is up, it percolates through the heart part and rots it also.

136. Ties obtained in Southern Indiana and Illinois, along the line of road. They are cut in winter. Hewn ties are found to be at least one-third more durable than sawed ties. Small timber preferred.

137. Ties are cut in fall and winter, and hewn ties preferred. The trees preferred that make but one tie to a length.

138. Ties are procured from the country adjacent to the road, from New Albany to Greencastle, and are cut from September 1 to February 1. Hewn ties preferred, and those from trees of middle size, that will make two ties from each cut. Ties bedded in good gravel ballast even with the tops of the ties, and full 12 inches deep below them, last much longer than in any other way tried, except when preserving substances have been used. Have never noticed difference in the life of ties by securing spikes in any way.

139. Ties come from headwaters of Kennebec and Penobscot Rivers and generally cut in winter. Hewn ties preferred, and those cut from trees that make one tie to a length. As a general rule it is found that trees grown on dry land will last longer. By far the largest part of ties are cedar. Juniper (tamarack) ties hold the spikes better. The Whitman patent was tried on some portions of track some years ago, but none has been laid recently. This consisted in letting into the cedar tie pieces of oak for the rail to rest upon.

140. Ties obtained from Georgia. Hewn ties are more durable, owing to the polish imparted by the process, while sawing cuts through and opens the pores of the wood. Trees furnishing but one tie are preferred, because younger and more life in the fiber, and therefore more durable. They are better appearing for elevated structures running through a city.

141. Chestnut is obtained along the line of road; cedar from Canada Ties are cut in the fall and winter, and it is better to have them seasoned. Hewn ties used, and those preferred that make only one tie to a length.

142. Ties obtained within 20 miles of L'Anse, on Keewenaw Bay, Lake Superior, and cut from December to April. Hewn ties preferred, because sawn ties admit and retain moisture more readily. Prefer trees that make but one tie, believing that the oval sides afford a better bearing than when sawed square.

143. Ties obtained along the line of road and cut at all times. Prefer sawed ties if all heart can be obtained, and large timber, as it has less sap wood. The small trees obtained along the line of this road do not make as good ties as the large timber.

144. Ties obtained from contiguous country, and should be cut after August. Good hewn ties preferred—made from trees that afford but one tie to a length.

145. Ties procured between Newport and Cove Creek, and cut in September. They are hewn, and are preferred from large timber, as they have more heart than those from small trees.

146. Ties had from along the line of road in Northern Wisconsin, and cut in December, January and February. Hewn ties preferred. Have used only those that make but one tie to a length. Experience has taught that the durability of hemlock and tamarack is reduced one-third if sand is used for ballast instead of good coarse gravel. We think cedar more durable for ties than white oak. Have known instances in which 5,000 ties were made on 40 acres (125 ties per acre), but think that one-half of this number would be a fair average.

147. Ties obtained from Houghton County, Michigan, and cut in winter; hewn preferred.

148. Ties from Minnesota, and cut in winter. They are hewn, and those are best that make but one to a length.

149. Ties from Osage and Gasconda Rivers, and along the line of road. They are cut in fall and winter; are carbolizing a few ties, but the result is not yet ascertained. Hewn preferred, and timber that makes but one tie to a length.

150. Ties obtained in Mobile County.

151. Ties got from swamps along the line of road from New Orleans to Berwick Bay, and the swamps of Grand Lake, and Atchafalaya River, and Bayou des Allemands. They are cut at any season, and hewn preferred if from small, sound trees giving one to a length, exclusive of sap wood.

152. Ties come from the Sciota Valley are cut in fall, or before the 1st of February. Prefer hewn ties, made from trees that furnish one to a cut, or what is called a "pole tie."

153. Ties obtained within 10 miles of the road, and cut in winter. It is deemed better to first season the ties and remove the bark before using. No preference is had between hewn and sawed ties. Second growth chestnut trees, grown on upland and making one tie in a length, are preferred. Experience has shown that ties laid in good gravel ballast, on an unyielding subsoil, will outlast ties that are laid in other conditions. The gravel ballast should be 2 feet deep. Ties that have often to be raised, or worked about, will soon wear out or rot out Ties in which loose spikes are allowed to remain, and by which means water enters into the tie, will also rot very quickly.

154. Ties obtained principally in Dickson, Hickman, Coffee, Warren, Franklin, Lincoln and Marion Counties, Tennessee, and cut in the fall and winter, when the sap is down. Hewn ties preferred. Trees make usually from one to three ties.

155. Ties procured along the line of road and cut at all seasons. Trees preferred that make but one tie to a cut; no difference between those hewn and those sawed. Time has not been allowed since construction to test extensively.

156. Ties obtained in New Haven and Litchfield Counties, and cut in winter. Hewn ties preferred, and made from trees of second growth, say thirty to thirty-six years of age.

157. Ties procured in the vicinity of Truckee, Cal., in the Sierra Nevada Mountains, and are cut in November and December. Hewn ties, with the bark off, are preferred. They should be made from small trees, furnishing one tie to a cut. Ties last in Nevada longer than in California or the Eastern country, where there is no alkali. The alkali in the soil along this line, and in fact almost anywhere in Nevada and Utah, preserves the wood from rot, as does also the dryness of the climate, making the life of ties at least two years more. Gravel or broken stone ballast is preferred over any other in this region.

158. Ties taken from near line of road and cut in winter. No preference between hewn and sawed ties, the timber being equal. Young, thrifty trees, not to exceed four ties to a cut, are preferred. No experiments have been made. The line is all ballasted with gravel and broken stone, and good drainage is sought.

159. About half the ties are procured along the line, a quarter from Ulster County, New York, and an eighth each from Connecticut and Vermont. They are usually cut in winter, and hewn. Trees that make but one tie are preferred.

161. Ties got from adjoining country, and cut in winter. Hewn, and trees preferred that make one to a length.

162. Ties got chiefly in Connecticut; a few from Vermont; none north of Brattleboro'. Cut in fall and winter, and sawn upon two faces only. Young timber preferred.

163. Ties obtained along the line of road, and cut in winter. Hewn, and preferred from trees that make but one tie to a length.

164. Ties procured between Pompton Junction and Cooper, N J., and cut in winter. Hewn, and from trees that make one tie to a length preferred.

165. Yellow pine is procured from South Carolina and Georgia. White oak from Canada West, chestnut from New York State, and cedar from Canada. Ties are cut in winter and early spring, and are hewn. They are from trees that make one tie to a length.

166. Ties are procured from along the line of road, and cut principally in winter. They are hewn, and make one tie to a cut.

167. Ties are obtained chiefly from points on the line of the road, but partly from the Connecticut River and the region east. They are cut in winter; stripped of the bark, and used in the spring and summer following. Hewn ties preferred, made from young and thrifty trees, which are more durable than the timber of old trees. This company is now ballasting its road with broken stone to a depth of 14 inches, stone of not more than 2 inches in size are used, and at the rate of 4,000 cubic yards to the mile. It is expected that ties in such a road-bed will last two years longer than in gravel ballast.

168. Yellow pine is obtained from Florida and Georgia. Other kinds are chiefly from Westchester and Putnam Counties, N. Y. Winter preferred for cutting, and ties seasoned before using. Hewn and made from trees that furnish but one tie to a length.

169. Ties all procured from near the line of road, except a small quantity from Canada, received at Buffalo. The ties are cut in winter, say from December to April, and are killed till August. The company operated Burnettizing Works from 1861 to 1866, chiefly for bridge timbers, but abandoned them when the shop burned in 1866. The results were not considered a success. Hewn ties are preferred, because less liable to break in the track. Prefer young thrifty timber, but generally get two or three ties from a tree. No experiments have been made. The line is ballasted with gravel and with broken stone. It is believed that ties last better in the latter, so far as decay is concerned, but on the heavily used portions of the line the oak ties are cut down by the foot of the rail wearing into them before they rot out.

170. Ties obtained from Western New York, Northwestern Pennsylvania, and Northern and Central Ohio, and are cut in autumn and winter. The Thilmany process has been tried, but it was not entirely satisfactory. It was used only on inferior timber, and after four years the wood was found decayed at the heart. It was sound before preserving. Hewn ties preferred, the bark being removed. Ties made from young thrifty timber are best, if large enough for one tie to a length. Old spike holes are plugged with wood made for the purpose. No experiments have been made as to different kinds of ballast. Have tried planting the Catalpa on a small scale, but not long enough to ascertain whether successfully or not.

171. Ties from Passaic, Mercer and Sussex Counties, New Jersey, and cut in winter. Hewn preferred, and those made from one to a length.

172. Ties obtained from Rhode Island and Connecticut, and cut from 1st October to

1st of April. No seasoning is employed, green ties being thought to last the longest. Hewn ties the most desirable, making one to a cut.

173. Ties procured along the line of road, and cut from November 15 to February 14, when the sap is down. Hewn ties made one from a length are preferred.

174. Ties had from line of road, and cut in autumn and winter. Hewn, and one from a length preferred.

175. Ties come from Northern Minnesota, and cut in winter. Hewn and made one from a length preferred. Several millions of trees have been set along the line of this road by the late Hon. L. B. Hodges, but chiefly as a windbreak.

176. Ties had from Sonoma County, California, and cut chiefly in the spring. They are split from large butts of what is known as "black hearted redwood."

177. Ties obtained from the line of road and cut in winter. Hewn ties preferred, and those that are made but one from a cut.

178. Ties obtained between Osgood, Ind., and Iuka, Ill.; between Beecher City, Ill., and Shawneetown, Ill., and between North Vernon, Ind., and Otisco Pond. They are cut in November and December, and hewn are considered much better than sawed. One tree to a length of second-growth timber is deemed the best.

179. Ties obtained along the Allegheny River and cut in winter. Those hewn from small timber preferred.

180. Cedar is procured in Maine and Nova Scotia; chestnut from the line of road, and some from Connecticut. Ties are hewn, and those that make one to a length preferred.

181. Ties are obtained in Pennsylvania, and are cut in March, April, May and June. They are preferred hewn, and from trees that make but one tie to a length, as these last longer than any other.

182. Ties obtained along the line of road, and are cut at all seasons. Sawn ties preferred, and those made from large trees.

183. Ties obtained from Geauga, Trumbull, and Lake Counties, Ohio; cedar from Michigan. No specification as to time of cutting. Second growth and hewn ties preferred.

184. Ties procured along the Potomac, James, York and Rappahannock Rivers in Virginia, and cut from November to April. Hewn ties from trees that make but one to a length are preferred. Observations have been almost exclusively confined to white oak, such as is used on the main line. On the branch roads second class oak is used, also chestnut. Cypress and hackmatack, all of which are hewn and used without any preserving process being employed.

185. Ties obtained on line of road in Mercer County, Pennsylvania, and are cut in winter and spring. Hewn preferred, and those that make one to a length.

186. Ties come from Western Pennsylvania and Rhode Island, and are cut in winter. Hewn ties from small trees preferred.

187. Ties procured from West Virginia, Western Pennsylvania, and Ohio, and are cut in winter. Those from small trees, and hewn, preferred.

188. Nine-tenths of the ties used on this road are from the Kanawha Valley in West Virginia. They are chiefly cut in the fall, and are not put down till one year afterwards. Hewn ties made one from a cut are preferred.

189. Ties are procured from within one mile of the line of road, and are cut in winter. Have used only hewn ties, and prefer young timber that makes but one tie to a length. The track has been ballasted with refuse dirt from the local mines, which affords good drainage. The rolling stock has been so light that the ties have not crushed, nor are the spikes often drawn to replace rails, all of which tend to prevent the decay of ties.

190. Ties from Cumberland, Jasper and Richland Counties, Illinois, and are cut in autumn and winter. Hewn ties preferred. This road is ballasted with a native soil; 1,200 ties per acre is a good yield.

191. Most of the Southern pine is from along the line of road. Ties cut chiefly in the winter season and sawn from large timbers.

192. Ties obtained from along the line of road, and generally cut in winter. Trees that make but one tie to a length preferred.

193. Oak, chestnut and hemlock are procured along the line of the road, and ties are cut when the sap is out of the wood. Hewn ties preferred.

194. Ties come from Sussex and Greenville Counties, Virginia, and from Northampton County, North Carolina. They are cut from November 1 to March 1, and hewn. Trees preferred that will make from one to three ties. Most of the ties used on this road are cut from low wet lands. Those from upland are much better, by at least 25 per cent.

195. Ties are obtained from Virginia and cut in winter. No sawn ties are accepted, and those made one from a length preferred.

196. Ties are procured from Virginia and North Carolina. Only hewn ties are used.

197. Ties obtained in Maryland, Delaware and Virginia, and are cut at all seasons. Prefer those hewn. Large trees are sawn.

198. Ties procured from the vicinity of the road, and are cut at all seasons. Hewn ties preferred by far and should be made from small timber yielding from 4 to 7 trees. This road being new, sufficient time has not been had to test the durability of different kinds of timber except black ash, which has given out in less than two years.

199. Cedar ties are from Canada and the eastern provinces. The other kinds are from the line of road. They are cut mostly in winter and spring and sawed. Trees preferred that will make two flat and two round sides. It is found that spruce ties cut and used through the White Mountains last equally as long as hemlock, but in low lands the hemlock lasts the longest. Second growth hackmatack is good for nothing, as the sap is thick and will rot in two years. Good sound cedar or an old-growth hackmatack is considered the most serviceable tie used on the road. When the road was built large numbers of oak ties, costing 40 to 50 cents each, were used, as they were represented to be much more durable than hemlock; but upon trial so little difference is found that no oak is now used, it being worth more for other purposes. Hackmatack will hold a spike better than cedar and is more durable, but as enough of this cannot be got, more cedar is used. For track-stringers or trestle-work, spruce will last seven years, while hemlock will not last more than five.

200. Ties procured from New Brunswick and are cut in winter. They are sawn and made one tie to a length.

201. Ties had from Spottsylvania and Orange Counties, Virginia, and are cut in summer and fall. Hewn preferred.

202. Ties come from Dutchess and Columbia Counties, New York, and cut in fall and winter. Preferred hewn and from second-growth timber.

203. Ties procured along the line of road and are cut mostly in winter. Only hewn ties are used. Young timber making one tie to a length preferred.

204. Ties from west of Rhode Island, and cut in winter; hewn. A chestnut tie on a road with light traffic, and laid in rock ballast, will last longer than in gravel. If the traffic is heavy it will wear out sooner than it will rot.

205. Ties procured along the line of road, and cut from October to April. Hewn ties preferred because they will last about a third longer. They should be made from young timber.

206. Ties from along the line of road, and generally cut in fall and winter months. Prefer hewn ties, made one from a length. Trees would grow to a size suitable for this in twenty to thirty years. Ties grown on stony lands are more durable than those from low or loamy soils. Ties seasoned in open air and sun will have much longer life than when bedded green. Ties laid in clay will last much longer than in sandy soils.

207. Ties obtained principally from along the line of road, and are hewn.

208. Ties from Franklin, R. I., and cut in January and February. Hewn ties preferred. Trees of thirty-five years' growth, have cut 5 to 6 ties to a tree. Preference is given to a young and quick growth.

209. Ties obtained from the counties of Virginia adjoining the James River, between Richmond and Lynchburg. They are cut at all seasons, and are hewn. All are from small trees.

210. Ties from Chesterfield County, Virginia, along line of Bright Hope Railroad. They are cut in November and December, and hewn. Those made one from a length are preferred.

211. Ties made from adjacent forest and are cut in winter or summer, not in spring or autumn. They are hewn and young trees are preferred.

212. Ties obtained from within 40 miles of Brownsville, Tex., and are cut at all seasons, but Mexicans prefer "the full of moon." They are hewn from necessity, as sawing would be almost impracticable, owing to crookedness. It is rare that a mesquit tree will yield, in cutting, more than one tie. This road was laid in 1871–'73, and on a great variety of soils. The mesquit timber used appears to be practically indestructible, as there is not a tie in the road that shows any signs of decay. The only process that could be recommended for this wood, for any purpose, is its submergence in water to kill the worm which gets into it. The Mexican woodmen, however, who use it very extensively, claim that in cutting the timber at the full of the moon the trouble from this cause is obviated.

214. Ties obtained in Cattaraugus and Allegany Counties, New York, and cut in January and February. Hewn ties are much superior to sawed, and one tie to a length is better than a larger size.

215. White-oak ties are obtained in Central Illinois, and white cedar chiefly from Michigan. The ties are generally cut in winter, and laid in the following summer. Hewn ties preferred, and trees that make but one tie to a length are thought best.

216. Ties obtained along the line of road, and are cut in fall. They are sawn, and one from a length.

217. Ties procured from Oxford and Androscoggin Counties, Maine, on the line of the road. They are cut in winter, and hewn. Small timber preferred because it lasts longest.

218. Ties obtained from adjacent country, and cut in fall and winter. Hewn ties preferred, and from trees making but one to a length.

219. Hemlock and ash are from Northern Vermont, and cedar and tamarack from the Province of Quebec. Perhaps one-third are cut in the fall and two-thirds in winter. Other things being equal, ties that are sawn are preferred. Small trees making but one tie to a length are better, as large trees are very often shaky.

220. Ties procured in Jackson, Union, and Alexander Counties, Illinois, and are cut at all seasons. Hewn ties preferred, and those from trees that make but one to a cut.

221. Ties are got from adjacent lands, and are mostly cut in winter. They are all hewn. The experience of this road leads to the advice that ties should be cut in February or March, and that they should be seasoned a year before being laid.

222. Ties are procured in the counties along the line of the road, and are generally cut in winter or spring. They are stacked up in the woods before hauling, and afterwards piled along the track. Everything else being equal, hewn ties are preferred. The large timbers, having generally less sap, would have preference, as toughness makes them more durable, but harder to work. The ties on this road are found to last best where the drainage is best, from which it is inferred that any ballast securing best drainage should be preferred. This road, in common with others, does not encourage the transportation of wood, and this tends to keep up the supply.

223. Ties obtained along the line of the road, and are cut in winter. Hewn ties are best.

224. Ties obtained from Washington County, Georgia, and are cut at all times of the year. Those sawn from large trees are preferred.

225. Ties from line of road, and cut in winter. No preference between hewn or sawed.

226. Ties from near the line of road, and cut in September. They are sawn from large timbers.

227. Ties procured in Sonoma County, California, and are cut from July to October. They are split from large timber trees, 10 to 18 feet in diameter.

228. Ties procured from main line, 60 miles west of Savannah, to Bainbridge; from Thomasville to Albany, from Dupont to Live Oak, and from Waycross to Jacksonville. It is cut at all seasons, and is hewn. Large timber split makes a good tie, if hewn straight and smooth, with plenty of heart.

The number of ties from an acre of ground varies considerably with the character of the growth, which itself shows a very wide difference in different localities. The timber used for ties is all from "virgin forests," and no efforts are made to plant and protect young trees for future use. The timber near the coast, in the low, flat, watery lands, is quite soft and spongy, with a large proportion of sap, and is not considered as good for cross-ties as the timber grown on the higher rolling pine and clay lands further from the coast.

There is also a wide difference in character of the cypress timber growing along the lines of this road. Although there is very little accurate knowledge in regard to the botanical difference between what is known as the black and yellow or white varieties, certain it is, however, that some sorts are soft, spongy, and worthless, and others are tough, hard, and durable. A competent inspector of cross-ties can tell by appearance of the wood generally if it is good or otherwise. An old inspector states, as the difference between the better and poorer qualities of pine and cypress, that in pine a poor quality of wood is indicated by long leaf, and thick, rough bark; and a good quality the reverse. In cypress, a poor quality of wood is indicated by a smoooth bark and light color when cut; the better quality the reverse, with the addition that the better quality will sink in water, while the other will float.

229. Ties obtained from the line of road, and are cut at any season. Hewn ties used, but no difference observed.

230. Ties obtained along the line of road, and are cut from the middle of October to the middle of March. No difference is made in the price of hewn or sawed ties, but the former are thought to be more durable. They should be made from trees that form but one to a length. The white and post oak along the line of road are getting scarce, and their growth is very slow. The trees are so scattering that no average of yield per acre can be given.

231. Ties procured along the road, principally in Virginia. It has been necessary to cut at all seasons; hewn preferred, and one tie to a length. Ties are received if sawn on two parallel sides.

232. Ties obtained along the line of road, and cut mostly in winter. They are hewn, and preferred from trees that make but one to a length.

233. Ties obtained entirely from along the line of road, and are cut in the winter season and laid the next summer. Hewn ties are preferred, and those that are made one to a length.

234. Ties from line of road, and cut in fall and winter. They are hewn in the log and allowed to season until dry, and are then cut into ties and laid in the road. Hewn ties preferred, and the trees that make but one to a cut.

235. Ties purchased from farmers near the road, and are cut in winter. Hewn ties from small trees are preferred.

236. Cedar, hemlock, and tamarack are from Michigan; oak and elm from Minnesota and Missouri; ties cut in winter; hewn, and from small trees, making one to a cut. Ties on heavy black soil last longer than on sand.

237. Ties from the country adjacent, and cut between February and April. They are hewn, and made from trees that furnish one to a length.

238. Ties obtained from headwaters of the Kennebec, and are cut in winter. Hewn ties are thought to last longer, and are preferred one from a length.

239. Ties obtained from the line of road, and are cut at all seasons; hewn preferred, and made one from a length.

240. Ties from line of road, and cut in winter; hewn preferred, and small trees that make but one to a length.

241. Ties from Santa Cruz Mountains and Coast Range north of San Francisco. They are hewn, and made from large timbers.

242 Ties from the Santa Cruz Mountains, and cut at all seasons. Hewn ties from large timbers are preferred.

The growth of the redwood tree is exceedingly slow. Trees of fifteen years age will make no more than three ties, the diameter of the tree being 10 to 12 inches. Trees of a diameter sufficient to make only one tie are never used, being considered too young for durability. The number of ties per acre from a redwood forest could not be estimated. By counting the rings of a redwood tree 146 feet in length, the diameter being 5 feet at a point 6 feet from the base, and allowing one ring for each year, we find the age of the tree to have been 940 years. The redwood tree of the Santa Cruz Mountains furnishes the best timber for ties, or for any use where the wood comes in contact with the ground. The average durability will probably exceed that of any other redwood on the coast by from five to seven years, it being much heavier and denser than that farther north. This accounts for the great average age of ties as given herewith.

243. Ties from along the line, and cut in winter and spring. Those hewn and made from small timber are preferred.

244. Ties from Pennsylvania, and cut in August. Hewn ties preferred, made from trees that allow but one to a length.

245. Ties from Ulster County, New York, and cut in winter. Hewn ties preferred, made from trees that allow but one to a length.

246. Cedar ties are from Canada; chestnut are from the line of road. They are cut in winter, and generally allowed to season one year. Hewn preferred, and those are best that are from trees that make but one tie.

247. Ties from the mountains of Sussex County, New Jersey, and cut in fall for use the next summer. Those hewn preferred for track, and sawed ties for switches. Small trees are best, making one to a length. The number of ties procured from an acre varies from 100 to 500, according to the quality of timber. It requires about thirty-five years to grow trees large enough for making two ties at the butt, the rest of the tree going into posts and fire-wood.

248. Ties obtained in Onondaga, Cortland, and Broome Counties, New York, and are cut in fall and winter. Hewn preferred.

249. Hemlock is obtained along the line of road and cedar from Canada. Ties are cut at all seasons, but winter preferred, so that by spring the bark will soften and strip off, before being laid in the track. Hewn ties are generally preferred, and those from young second-growth timber appear to be best.

250. Ties from adjacent regions, and are cut in November, December, and January, and piled till the next summer. Hewn preferred, as they are proved to be most durable. Small trees are best, making but one tie to a length.

251. Ties are obtained from Southeastern Texas and Southwestern Louisiana, and are cut from July 15 to November 1. Sawed from large timber, because less sap is used. Cypress piling is all sawed, by which means experience has shown that a gain of 30 to 35 per cent. is made in preventing rot at the earth and water line. A coating of asphalt or pitch is applied warm, it being of the consistence of common roofing pitch, and used from 3 feet below to 3 feet above the water-line. To prevent dry rot at the head of piles, salt is used, it being inserted to the depth of 20 inches, and compactly pressed into an augur hole 1¼ inch in diameter. This method of treatment has proved very valuable.

252. Ties are obtained from Southeastern Missouri, Eastern Arkansas, and Eastern Texas. They have been cut at all seasons, and are generally stacked two or three months before using. Hewn ties preferred, both having been used.

253. Ties from Eastern Texas, and cut at all seasons, but mostly in summer and fall. Ties are sawn from large trees, and as near to the heart as obtainable. The mill-men claim that there is a large loss from wind-shakes. From the rapid depletion of the forests and the increasing amount of railroad building, ties will advance at least 50 per cent. in price within ten years.

254. Ties are procured from Gulf ports, from Lake Charles to Pensacola. Hewn ties from trees that make but one to a length are preferred.

255. Ties are from Tioga County, Pennsylvania, near the line of road. They are cut mostly in winter. The hemlock ties are laid as soon as possible. No difference is observed between sawn and hewed ties, but those from small timber are preferred.

256. Ties are got from along the line of road, and those hewn and made from small trees are preferred.

257. Ties are from line of road, and cut at all seasons. Hewn ties from small trees preferred.

258. Ties from Bradford County, Pennsylvania, and cut in fall and winter. Hewn ties preferred, and from trees making one tie to a length.

259. Ties from Macon County, Alabama, and cut in August. Sawn ties from large timber preferred.

260. Ties from Wahsatch Range, and cut from December to April. They are piled in ricks 5 feet high for one year before being used. Hewn ties from trees that make but one to a cut are preferred.

261. Ties from along the line of road, and cut in winter. Prefer hewn ties made from trees that furnish one to a length.

262. Ties from Cuyahoga Valley and the valley of Nimishillen Creek and Sandy River, Ohio, and cut principally in winter. They are piled in open cross-piles till needed for use. Prefer trees that make one to a length, but no preference between hewn or sawed.

263. Ties from along the line of road, and cut in winter. Hewn ties made from small trees are preferred.

264. Ties are procured along the whole of main line and branches, but most between Lynchburg and Danville. Hewn ties from trees that afford one to a length are preferred.

265. Ties from Scott and Newton Counties, Mississippi, and are cut at all seasons. Hewn preferred

266. Ties come from coast counties of California. Sugar pine and red fir from the Sierra Nevada Mountains, near Lake Tahoe. Ties sawn from medium-sized timber are preferred. Ties are found more durable where broken stone or gravel is used as ballast. The climate being dry and exceedingly hot in summer, ties are affected by dry rot, particularly if ballasted with sand. Our mountain timber being of slow growth, no data can be given. We know, however, that the higher the altitude the poorer the timber, as it becomes coarse grained and brash.

267. Ties obtained from Fairfax and Loudon Counties, Virginia. The best season for cutting is from November 1 to March 1. Well-hewn ties will last about two years longer than sawed ties. There appears to be no great difference between small and large timber.

268. Ties from Greene County, Pennsylvania. Prefer those that are hewed, but use mostly sawn, as the former cannot be had at the same price.. The trees are best that make but one tie to a length.

269. Ties from northern counties of Maryland and southern border of Pennsylvania, and are cut at all seasons. No preference between hewn or sawed ties, but those from small trees are best. Ties upon broken stone are found to last longer than on earth, clay, or gravel. The age of ties reported applies to those in stone ballast.

270. Ties obtained from uplands on the line of road between Montgomery and West Point, and are cut in the fall. Hewn ties preferred, but those made from large timber.

271. Ties are obtained from swamps near Bayou Sara. They are deadened in summer and cut in winter or spring during high water. Hewn ties will last a little longer than sawed ones, all things else being equal. Large timber is sawed. Ties laid in black loamy soil rot out in one-third the time of those laid in a clay soil. Ties on embankments rot sooner than in cuts. Ties exposed to the sun all day rot out in less time than those which are shaded a part of the day. Shade and a free circulation of air combined are requisite to the best lasting of any timber in our climate.

272. Ties obtained from the country along the line of road, which is of a very broken or hilly surface. They are principally cut in the fall, and in January, February, and March. Hewn ties from small trees preferred.

273. Ties obtained in West Virginia, and are cut between December and March. Hewn ties from small timbers are preferred.

274. Ties from Maryland, Virginia and Delaware, and a part of the chestnut from New Jersey. They are cut in winter, and hewn ties made from small timber are preferred.

276. Ties obtained along the line of road, and from Virginia. They are generally cut in winter, and hewn ties made from small trees are preferred. The experience of this road shows that while white oak ties will wear the longest; they become worm-eaten below the surface of the ground. Chestnut ties wear out by "brooming up," where the rail rests, before they decay. They will not decay so soon as oak. Cy-

press ties will not decay as soon as either of the above, but are too soft for traffic. The wood does not decay, but becomes brittle, and breaks just outside of the rail. The three kinds have worn about the same length of time on this road. Ties mostly lie in a bed of gravel, shale, and clay. No attempt is made at broken-stone ballast. The ends of ties have not been covered, but left exposed to the air.

277. Ties from Michigan, Wisconsin, and Minnesota, and are cut in winter from young trees. No preference between hewn and sawed; small trees preferred.

278. Ties obtained along the line of road, and cut in winter. Hewn ties from small trees are preferred.

279. Ties are procured in the vicinity of Hope Valley (from 4 to 8 miles), and mostly cut in winter, and part are seasoned, but some are laid green. Hewn ties from small trees are preferred.

280. Ties from Woodstock and vicinity; cedar ties are from Canada. Timber cut from September to April, and hewn ties from small trees are preferred. Large trees are apt to be shaky.

281. Ties from along the line of road, and are cut in the spring, up to the time that the sap begins to rise. Hewn ties from small trees are preferred.

282. Ties are obtained from the line of road, and are mostly cut between November 1 and March 15. There is not much preference between hewn and sawed ties; small trees preferred, as the timber is harder, more compact, and more durable. Have used some cedar ties from New Brunswick, but they were not liked, and became a mere shell from internal decay, and dangerous before the fault was noticed by the trackmen. Nothing but chestnut is used where it can be got.

283. Ties are obtained along the line of road. As to durability, there is no difference between hewn and sawed ties. The latter are more easily kept in place. Prefer those made from small trees that furnish one to a length. A great durability is shown in ties upon stone ballast as compared with clay bed. Rock oak is preferred to all timber, as it holds the spikes firmly, especially on sharp curves.

PRESERVING PROCESSES.

But very few instances are reported in which preserving processes have hitherto been tried for giving greater durability to railroad ties upon any of the roads in the United States; and the few that refer to them either have not had time to ascertain the result, or have failed to realize the benefits that were expected.

Upon the Flushing Railroad Burnettized ties were used in building the pile-work near Flushing village in 1868; the timber being green spruce, 12 by 12, sawed, and used as stringers, from 4 to 10 feet above the level of the salt meadows. They appeared to have been thoroughly treated to the heart. There being some deficiency in the supply, the work was completed with white-pine stringers (not Burnettized) of the same dimensions as the spruce. Upon repairing the pile-work the Burnettized timber was found decayed in the heart, leaving a shell of from 1 to 3 inches, while the pine was comparatively sound, some portions being merely sap-rotten an inch or so deep on the outside.

The roadmaster then in charge, and who writes apparently without the least interest or prejudice, considers the Burnettized timber unsafe for railroad structures, on account of its decaying at the heart and leaving a shell that is sound, which would naturally lead employés to regard the timber safe for trains after it had reached a degree of weakness that was altogether dangerous within. He thinks that this process has a tendency to produce dry rot, especially of pine or soft wood.

It would, however, be unfair to draw conclusions from American experience, and perhaps it would be just to attribute some, at least, of the failures that have followed to the inexperience of workmen and to the superficial and imperfect manner in which these processes have been applied.

Taking the experience of Europeans in this matter, which has been so long and so uniformly successful that it cannot be doubted, there is no doubt but that very great economy can be gained in the way of prolonging the durability of timber as to its rotting upon the ground or

buried in ballast, and that when prices advance to a certain point the same methods may be applied in this country with like results. The wear and tear of railroad ties from crushing out under the rails, or from injuries received in lifting or moving, and from the driving and drawing of spikes, appears to be in many cases even greater than from natural decay, and in these respects, of course, no process is effectual unless it hardens or toughens the timber so as to better fit it for enduring this usage.

It is thought proper in this connection to give a description of the processes employed in some European countries, where much experience has been acquired, and where they are unquestionably used with economy and profit.

The two kinds of wood chiefly used in France for ties, after chemical preparation, are the beech and the maritime pine, neither of which would be scarcely worth using at any price in their natural state, but which when prepared are found to acquire a durability that gives them great value for this use. We will present the statements published in 1878 by the Forestry Administration, in the Department of Agriculture and Commerce, in connection with the Universal Exposition at Paris in that year. The notices were both prepared by M. Croizette-Desnoyers, who holds the rank of garde général des forêts, and bear the approbation of the Government.

BEECH (*Fagus silvatica*).

Of this timber about 5.5 per cent. of the total production of the forests under the care of the Forest Administration* is employed for railway ties. The considerable resources in this timber which our forests afford, and the improvements which are being constantly made in preserving processes, the growing prices of oak, and the durability secured in beech for railroad ties, when properly prepared, are the principal reasons that tend to give a growing importance to the preparation of this timber for this use. The construction of new lines of road and the maintenance of those already built demand an enormous quantity of wood. Railroad ties are placed in conditions most unfavorable for durability. Besides being exposed to the constant alternations between excessive dryness and extreme moisture, both unfavorable to their preservation, they have to bear the weight of heavy trains, under the pressure of which the chairs are pressed into the wood, and the lateral pressure they receive tends continually to tear out or loosen the spikes. The natural causes of decay combine with these effects from passing trains to shorten the durability of the ties.

It follows from this that wood that is to be made into ties should present the following qualities:

1. It should have great resistance against crushing or compressing forces, since the tie must transmit to the ballast a pressure of 60 to 70 pounds to the square inch.
2. The fibers should be very close and the tissues homogeneous.
3. The timber should be able to endure alternations of dry and wet without rapidly decaying.

The beech in its natural state meets the first two of these requirements very well, and the third is easily secured by a special preparation intended to neutralize the principles of decay which the timber contains.

The tie must have a certain stability in its mass, and must not be too short and small. If the gauge is 4.9 feet, it should not be less in length than 8.53 feet. If it is thin, it is liable to break; the fastening is insecure; and if too narrow, there is not enough surface for the ballast to support. The thickness should be some 2 inches or so more than the length of the spike, and 5½ inches will do tolerably well.

The average dimensions of ties are as follows: Length, 2.60 meters (8.53 feet); breadth, 0.24 meters (9.45 inches); thickness, 0.14 meters (5.51 inches).

The average contents of a tie should therefore be 0.087 cubic meters; that is to say, twelve to a cubic meter (=3.12 cubic feet each, or 8¾ to a cubic yard).

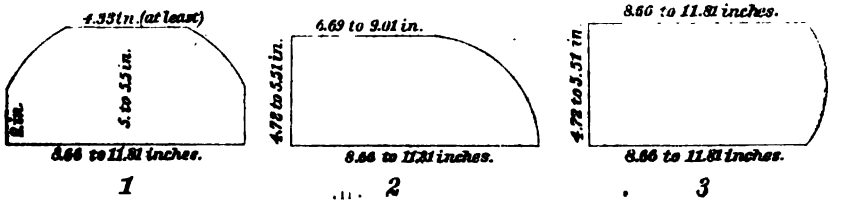
The beech ties used by different companies are not all of the same size. The proper size depends upon the weight of the rail and of the rolling stock, the greater or less frequency of trains, the kind of ballast, and some other considerations must be taken

* This includes timber growing upon the public domain and upon lands belonging to the communes and to public establishments, but not upon private estates.

into the account in determining the dimensions. Some companies make a difference between ties for joints and for intermediate spaces, while others use only the latter, but select the largest pieces to be used where two rails meet.

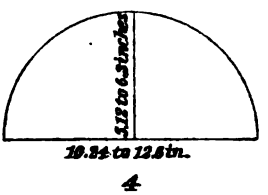
The forms of the ties are variable. Those used by La Compagnie du Nord are generally of smaller size, and are shown in the following sections, with the dimensions of least admissible size. They receive ties having rectangular faces sawn upon one, two, or three sides, and which may be arranged in the following classes:

1. Those having at least three sawn faces, as shown in figures 1, 2, and 3, the under face being at least 8¾ inches wide and the least thickness from 4.72 to 5.51 inches, and of the following forms:

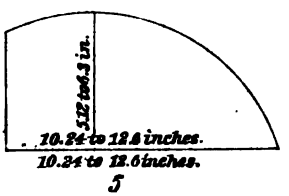


Only 4 per cent. are admitted which measure as low as 8.66 and 9.01 inches in breadth. The two narrow faces in Fig. 1 must be at least 2 inches wide the whole length of the piece, and the upper face must not be less than 4¼ inches in any place.

2. Half-round ties (Fig. 4) require at least a diameter of 10¼ inches on the flat side.



3. Ties with two flat sides and the rest oval, as shown in Fig. 5. Their base and height must be at least as great as in class No. 2. The lateral face should not be less in any part than 3.94 inches.



Such are essentially the least dimensions accepted in beech ties. They should, moreover, be nearly straight, no curve in which the verse-sine is more than one-twentieth of the length being allowed. The lower face must be perfectly flat and the ends must be cut square.

The various modes of preparation of beech ties may be arranged under two classes, one of these being such as expel from the wood the injurious principles that it contains and replace it by a neutral substance; the others have no further object than to protect the exterior surface, not penetrating into the interior. We will now proceed to notice separately the processes by injection and those by external preservation.

The methods by injection rest upon a principle proposed by Dr. Boucherie, which consists in expelling the sap from the wood and replacing it with an antiseptic liquid. The one first employed, and the most rational of all, is effected by the aid of pressure, by which the sulphate of copper is made to fill the piece to be prepared. This pressure, by the ordinary rule, amounts to 14.19 pounds to a square inch of the section where the pressure is applied, and is obtained by placing the tubs that hold the solution upon a scaffold about 32.7 feet high. Under this pressure the liquid drives out

the sap and takes its place in the wood. At first only the pure sap comes out, then a mixture of the sap and the solution of copper, and the process is continued until the latter alone comes out. The time required for the operation varies with the dryness of the wood, the size of the logs, and the condition and temperature of the air, and is at least five hours. This eminently rational process can only be applied to timber that has been recently cut and upon which the bark is still entire. If peeled the liquid oozes out on the side, and if the wood is dry the liquid penetrates with difficulty, at least unless the pressure is increased, and this increases the expense.

The sulphate of copper is introduced into the wood in the log at the rate of 5.5 kilograms to a cubic meter (7.19 pounds to a cubic yard, or 0.266 pound to a cubic foot), and it dissolves in water at the rate of 8 pounds to the gallon. The quantity of the sulphate absorbed is tested either by chemical analysis, or in the yard by means of a reagent composed of 90 grammes of the ferro-cyanide of potassium dissolved in a liter of water (3.15 ounces avoirdupois to a quart). This is dropped upon the wood, and if the process is complete it gives a very distinctly red spot, but if insufficient the tint is rose-colored.

The northern and eastern companies buy the wood in the log and employ this process. It comes to the yards in lengths of two and three ties and is there injected, when the ties are worked into form by the aid of saws driven by machinery. The preparation costs about 20 cents for each piece.

For injecting many ties at a time, after they have been wrought into shape, they employ the process of exhaustion and pressure in close vessels, as follows:

The ties are placed in a cylinder from which the air is expelled by steam, when a vacuum is formed; but it should not go below 2.36 inches of the mercurial gauge. This exhaustion is continued long enough to draw out of the wood its excess of moisture and to permit the disengagement of the gases that it holds. The cylinder is then filled with the solution heated to 122° Fahr., and a pressure is gradually applied till it equals from four to eight atmospheres (60 to 120 pounds to the inch), and this is maintained by the aid of pumps until the whole of the wood is penetrated, an operation that requires at least half an hour.

The results of this preparation are tested by sawing two pieces 5 meters long (16½ feet) and having double the thickness of ordinary ties. They also use the ferro-cyanide of potassium, as in the preceding case. The solution is formed by 2 kilograms of the sulphate of copper to a hectoliter of water (4.4 pounds to 26.4 gallons), or 20 kilograms (44 pounds) to a cubic meter, and they cause 200 to 250 liters (52.8 to 66 gallons) of the solution to enter a cubic meter of the ties.*

This process is more expeditious than that of M. Boucherie, since they can inject about 200 ties at a time; but it requires a more costly establishment, and the results are not as complete as in his system. Still the process by close receivers, on account of its convenience and its rapidity, notwithstanding its faults, is much the most largely employed. The operation costs about 14 cents per tie.

The sulphate of copper is not the only neutralizing substance that is used in the preparation of ties. They also use creosote for this purpose. This is the heavy oil that comes over in the distillation of gas-tar (at about 200 degrees), and which, on account of the ease with which it penetrates, gives a most complete result. It has not the grave fault that is found in the sulphate of copper, in decomposing the iron with which it comes in contact, forming by this action the sulphate of iron, which rapidly decomposes the wood. It must, however, be added that its superiority is not yet entirely proved. The process of injection is by exhaustion and pressure, the same as with the sulphate of copper, and it costs somewhat more, on account of the higher price of the materials used, amounting to 18 cents per tie. The Compagnie de l'Est creosote most of their ties.

The processes which have for their object to preserve only the exterior portions of the wood, without penetrating the interior, are as follows:

Hot immersion.—This consists in plunging the ties in a solution of the sulphate of copper, heated to 60° C. (=140° Fahr.), which is done in large tanks connected with a boiler which discharges steam into them, to raise the temperature to the proper degree. The solution is made with 4.4 pounds of the sulphate to 26.4 gallons of water, and is prepared in a separate tub, to be discharged into the tank when heated to the proper degree. The proportion is tested by means of a graduated hydrometer.

The ties should remain two hours at least in the solution, which is kept meanwhile at the temperature above mentioned. The impregnation does not penetrate but a small and scarcely measurable depth, but it serves to give the ties a coating that will prevent them from decomposition from the weather. At least 12.1 pounds of the sulphate should be taken up by a cubic meter of the ties (=15.8 pounds to the cubic yard). The success is tested as above described by a solution of the ferro-cyanide of potassium, and the process costs about 11 cents per tie.

*Equal to 57½ pounds, or 68 to 86½ gallons to a cubic yard.

Carbonization.—This consists in the charring of the surface of the tie to a small depth, and to accomplish this two methods are employed, as follows:

By the *Hugon process*, a jet of air from a forge-bellows is passed over a coal fire, producing a tongue of flame, which is made to pass over every part of the wood, placed upon a sliding rest, allowing free movement in all directions. This process involves considerable expense, owing to the large amount of hand labor that it requires, for it is necessary to char not only the sides but the ends of each piece, and to expose six surfaces to the flame requires much time. It is not possible in a day of ten hours to prepare more than 200 to 250 ties.

By the *Ravazé process*, now used for the external carbonization of ties, the following proceeding is had: The apparatus consists of a cylinder 8 meters (26⅛ feet) in length, with a diameter of about 0.6 meter (23 6 inches), lined internally with fire-bricks, so as to bear the action of fire from bituminous and schistous coal. At the end opposite to the fire is built a chimney so high that its draft will carry up the flame after it has passed through the whole length of the tube.

The ties, placed upon a rest, are drawn through the tube on an endless chain moved by steam power, and are at once exposed directly to the action of the flames. They take fire and by their own combustion furnish in part the heat necessary for the process, so that when they come out at the further end they are charred completely on every side and perfectly wrapped in flames. The speed of the chain is so regulated that time occupied in passing through is just enough to give the desired result, and it takes about two minutes.

As soon as the ties come out they are extinguished by a jet of water supplied from a reservoir placed above the apparatus. This process is employed by the Compagnie d' Orleans and several others, and can turn out from 900 to 1,200 ties in a day, at a cost of not over 6 cents apiece.

Lastly, by a recent improvement, destined, no doubt, to give excellent results, the ties, after carbonization in the cylinder, are plunged into a tank of coal tar, heated to 80° to 90° (=176° to 194° Fahr.), by which, with the pores expanded in the fire, the liquid can penetrate very readily, so that in fact each tie will absorb about 4.4 pounds. This immersion costs about 6 cents per tie, and presents most important advantages.

Summing up the foregoing, we find, in brief, the following comparative results:

	Cents.
1. By complete injection:	
Boucherie process, costing per tie	20
The same in close vessels with exhaustion and pressure	14
By creosote in close vessels	18
2. By external preparation:	
Immersion in bath of hot sulphate of copper	11
Carbonization only	6
Carbonization and immersion in coal-tar	12

An injected beech tie ought to last from 9 to 12 years. The trees taken for this use ought to be of good quality, in full growth, without worm-holes, rotten spots, defective knots, frost-cracks, seams, internal disease, or other faults. Redwood—that is, the wood which has passed its prime—ought not to be used. In selecting wood for injection it is indispensable that it should present none of the faults above enumerated, because the absorption of the antiseptic material is not complete if they are present, and they will, of course, not last as long.

The trees taken for ties should not be less than 9.89 inches in diameter; they may be of any larger size, but they seldom work trees of more than 59 inches in girth. They frequently make ties from the branches. The waste in making is quite variable, and depends upon the size of the trees, it being at least 10 per cent. of the volume in the log.

The companies very often buy the wood in bulk, and at other times the ties are made upon the place where they are cut, and sold by the contractors. Beech ties, on the spot, are worth from 65 to 70 cents apiece. They average 3.07 cubic feet each, or about 41 to a cord. The working costs 12 cents apiece, and hauling to the station about 7 cents.

The beech is worked into ties in many of the departments, and about 74,859 cubic meters (2,693,544 cubic feet) are supplied annually from the forests under the governmental care.

In studying the qualities of the European beech with respect to its resistance to crushing forces, as compared with other woods, it is found that it is superior to the English oak and the alder, if the wood is in its ordinary condition of dryness, but if extremely dry it becomes inferior to the oak, and superior to the ash and alder. Under traction it

is about equal to the oak. It presents, therefore, a high degree of excellence as well in respect to compression as extension, while its transverse resistance under flexion compares well with other woods. Its durability under water is remarkable, rendering it suitable for marine structures that are always submerged.

Of the total amount produced in the French forests under the care of government, 80 per cent. is used for fire-wood, 5½ per cent. for railway ties, 3.5 per cent. for sawn lumber, 5 per cent. for wooden shoes, and the rest for carpentry, turning, and as material for manufactures of various kinds.

MARITIME PINE (*Pinus pinaster*).

M. Croizette-Desnoyers, in the publication already noticed, makes the following statements concerning the preparation and use of this timber for railway ties:

The preparation of railway ties from the maritime pine in France is constantly increasing, the Orleans, Southern Medoc and Charentes lines employing great quantities, besides large numbers sent to Algeria and to Spain. This pine is much inferior to oak or beech, but it receives the preservative material better than either, and it is much less costly. A pine cross-tie, worth 40 to 50 cents in its natural condition, is sold prepared at 60 to 70 cents. Their relative cost and durability is as follows:

Oak (not prepared) costs $1, and lasts 15 years.

Beech (prepared) costs 96 cents, and lasts 12 to 15 years.

Pine (prepared) costs 65 cents, and lasts 10 years.

If, therefore, a pine forest is found convenient, there would be an advantage in using ties made of this timber.

The French railroads require ties that are 8.5 to 9 feet long; the Spanish roads 9.15 feet, and those of Algeria 6.89 feet. The Orleans Company, using every year 100,000 pine ties—that is to say, a fifth part of the whole amount needed for the maintenance of its system—receives ties of either of the following classes:

(1). Sawed upon four sides (7.48 to 11 inches in breadth for middle, and 11.42 to 13.12 in breadth for joint ties, their thickness being 5.12 to 5.9 inches, respectively). They may be sawn on three sides and round on the fourth, but in this case must be somewhat larger.

(2.) "Pole-ties" (*traverses debrins*). Sawn upon two faces, and round on the sides, with the bark peeled. The upper face must have a breadth 7.48 to 9.84 inches, and the lower face from 4.72 to 7.08 inches, with a thickness of 5.12 to 6.28 inches.

(3.) Half-round ties should give a space of 4.72 inches of heart-wood for the chair, and their breadth varies from 10.24 to 13 inches for middle ties, and from 13 to 14.17 inches for joints.

They should be all dressed smooth, completely stripped of the bark, and essentially straight, the greatest verse-sine of curves not exceeding one-twentieth of the length. The company requires ties to be from 8.5 to 8.83 feet in length.

Ties of maritime pine are prepared by the Boucherie process in close vessels, by exhaustion and pressure. A manufacturer at Bordeaux has invented a process called *thermo-carbonization*, for the injection of wood by the vapor of creosote. His apparatus consists of a boiler for making steam; another for generating the vapor of creosote, and a cylindrical receiver for holding the wood. The steam from the first boiler is sent into the second, where there is a constant agitation kept up to prevent deposits. They both are finally conducted into the receiver, where the ties are placed. The wood will absorb about 43½ pounds of creosote to a cubic yard. After this operation of injecting vapor, the ties are plunged into a solution of creosote, and for this operation, which is applied in the cylinder where the wood is placed, the liquid is admitted, and a pressure of two to three atmospheres is applied by the steam in the first boiler.

The wood absorbs in all 88 pounds of creosote to the cubic yard, and the injection is very complete; but the process presents the very serious objection of being costly. There is a difference of 60 cents per cubic meter between wood thus prepared and that injected in close vessels under pressure. The waste is about 30 per cent., and they get but nine or ten ties from a cubic meter. A tree 55 inches around, under the bark, will make 9 ties; one 52½ inches around, 7 ties; one 47½ inches, 6 ties; one 43½ inches, 4 ties; and one 39½ inches, 2 ties. They are wrought into form at 7 cents apiece, and their transportation to the place where used averages 10 cents.

In a work of approved authority upon native and foreign woods, by

Messrs. Dupont and De La Grye,* the following general statements are given concerning the use of timber for railway ties:

The railways use large quantities of ties for the construction of new lines, and for maintenance. The kind most esteemed, and at first the only kind used, was the oak; but when this could no longer be obtained, excepting at a high price, they had recourse to others of less durable qualities, but which could be had at much less cost. These substitutes for oak would last but a short time in their natural state, but fortunately there have been found several processes of preparation, by injection, carbonization, &c., which enable us to use them, and even to employ the sap-wood.

The various companies do not follow the same rules of proceeding, doubtless because the experimental period has not yet ended, and because they must be governed by the resources and opportunities at their command. It may be, however, that they prefer the heart of oak, squared, if they can get it at moderate prices, and that for want of this they take ties of oak that are half-round, where the heart wood is a considerable part, as well as squared, half-round, or mixed ties of beech, hornbeam, pine, and fir; but these they take care to prepare by injection. The heart of oak is the only wood employed without any preserving process; but upon the Orleans lines they take care to carbonize their ties externally by the Hugon process.

The durability of these ties varies with the quality of the woods employed, their dryness when the process is applied, the nature of the soil, and of the ballast, and the climate. We find given in the beautiful work of M. Couche upon the rolling stock and technical working of railroads a statement of the durability of prepared ties upon the various lines of road in France and abroad, as also tables showing the duration of ties upon the German railways, received at the Dresden reunion in 1865, but made up from data that admit of but little comparison.

The climate has a considerable influence. Thus it was found that pine ties not prepared, which would last four or five years in Germany would not endure two in northern Spain; but this may have been due to the fact that the former were of the "Scotch pine," while the latter were the maritime pine. The durability is still less in Brazil and in India. In fact, the establishment of railroads is still too recent for us to establish definite rules for the durability of different kinds of woods.

The dimensions of ties used by different companies varies from 7.19 to 7.85 feet in length when the gauge is 4.9 feet wide, it being found that shorter pieces wear out more quickly than longer ones; so that now they often use ties that are 8.17 to 9.15 feet long. The breadth and thickness depend upon the form of the wood. They should not be too heavy, for then they become unwieldy and not easy to tamp, and if too small they are pressed down into the ballast. The least breadth received is 7.87 inches, and they are seldom more than 9.84 for middle ties, but those used at the joints are from 11 to 13¾ inches wide. As for thickness they are never less than 4¾ inches, and from this up to 5.9 inches for square, and 7.1 inches for half-round. A middle tie should have 2.82 to 3.18 cubic feet, and a joint tie 3.88.

Triangular ties ought to be abandoned. They were employed from economical reasons, but they oscillate around on their lower edge, and very rapidly wear out. In order to obtain ties at a moderate price the companies receive wood more or less defective in form, provided that it is sound, and admit a certain amount of curvature, at reduced rates.

These writers, after giving details as to form, sizes, and preparation, with estimates based upon the French railways, admit the want of data from experience, on account of the comparatively recent period in which railroads have been used, and notice the growing scarcity of oak and the necessity of finding substitutes in other materials. They state that the English railways are almost exclusively supplied from the resinous woods of the Baltic and from Norway, and to some extent from Canada, and that it is injected with creosote before using.

SUBSTITUTES FOR WOOD IN RAILWAY TIES.

The increasing cost of wooden ties has led to various attempts to substitute other materials. Among the first of these, and in fact the first that was tried, is stone. It has, however, been found that the concussion of passing trains would soon beat down the rails over these points of solid support, and it was found necessary to have something a little

* *Les Bois indigènes et étrangers.* Paris (1875). P. 454.

elastic, or at least that would distribute the pressure somewhat uniformly over a wider surface. In the first railways constructed in tropical climates it was found that ants were so destructive to most woods that other forms of support became necessary. The lignum-vitæ and various forms of iron supports are used in these cases, involving a heavy outlay in first construction, but less for maintenance, and perhaps with greater economy, taking long periods of time into the account.

About twenty American patents have been granted for railway ties of material different from wood, and most of them proposing the use of iron in whole or in part. We have no experience reported from any of these. Any form of metallic tie would at least present the advantage of uniformity in size, not easily secured in those of wood. Several European railways use iron ties exclusively, but we have no details of their construction and no data for showing their durability or cost.

GENERAL CONCLUSIONS.

From the statistics of the 70,886 miles of track reported in the preceding pages, we may be warranted in drawing certain general conclusions applicable to our whole railway system, and in presenting certain estimates of the amount of timber that will be required for their maintenance.

The total length of railroad track at present existing in the United States cannot be less than 112,000 miles; of this, 70,886 miles, or 63.3 per cent., were reported, including all the older and best established companies, many of those not reporting being new lines without experience as to the durability of the material used as ties.

We will assume that the average durability is seven years, the average distance apart 3 feet, making 2,640 to the mile.

	For the part reported.	For the general total.
Miles of track	70, 886	112, 000
Number of ties in use	187, 139, 040	295, 680, 000
Required annually (377 to a mile)	26, 734, 149	43, 240, 000

It could not be expected, on a general average, that trees could be grown to a size sufficient for making ties in less than thirty years. The average number that can be cut from native-timber land would probably not exceed over 100 to an acre, although with proper cultivation it should be many more.

For a perpetual supply, it would be necessary to have as many times the area cut over every year as there are years in the age of trees at time of cutting. As the amount of woodland cut over every year would be 267,341½ acres for the roads reporting, or 422,400 for the whole, the acres (of all ages) that must be kept in timber would be thirty times these quantities, or 8,020,245 acres for the roads reporting, or 12,672,000 for the whole.

To supply 377 ties to a mile would require the cutting off of 3.77 acres to a mile every year, and for permanent supply there should be maintained 113.3 acres of growing timber to every mile of track. Whenever the time may come that railroad companies shall undertake the planting of timber for their ties, it will be a matter of obvious advantage to have it located in compact bodies, and in tracts of considerable size. With conveniences for floating, these lands need not even be adjacent to

the line of road. The subject is a most important one, and deserves the thoughtful attention of those intrusted with the care of these important interests.

FRANKLIN B. HOUGH.

Hon. GEORGE B. LORING,
Commissioner of Agriculture.

NOTE.—The circular, from answers to which the preceding tables have been compiled, was sent out to the railroad companies late in the year 1882. It is somewhat uncertain whether their replies were intended to show the facts as they existed in that year or the previous one. During the years 1881 and 1882 our railroad system was greatly extended. Poor's Railroad Manual gives the total mileage of track on the 1st of January, 1883, as 138,901.66. At the same rate of increase the amount of track now in use would vary but little from 150,000 miles. If we adopt this estimate, it will show a greatly increased demand upon our forests for the purpose of railroad construction, beyond that indicated by the returns given in this report. It will show that for the construction of our existing roads we have used 396,000,000 ties, or the wood supplied by 3,960,000 acres, or an area larger than that of the States of Rhode Island and Connecticut. Estimating that ties need to be renewed, on an average, once in seven years, there must be drawn from the forest annually, in order to keep the existing roads in repair, 56,571,428 ties, or the timber growing on 565,714 acres. Allowing that a growth of thirty years is necessary to produce trees of proper dimensions for ties, it will require 16,971,420 acres of woodland to be kept constantly growing as a kind of railroad reserve, in order to supply the annual needs of the existing roads. This constitutes an area considerably larger than the State of West Virginia, and larger than the States of New Hampshire, Vermont, and Massachusetts combined, or the States of New Jersey, Maryland, and Delaware, with the addition of Connecticut. It is more than 4 per cent. of the total area of woodland in the United States, exclusive of the Territories, and 3 per cent. of the area in the States and Territories together.

This shows the state of the case for the present and the past. But there is another view. The increase of railroad mileage in the United States from 1873 to 1882, both inclusive, was 48,879 miles, or an average annual increase of 4,887.9 miles. The increase from 1863 to 1872, both inclusive, was 34,167 miles, an average of 3,416.7 annually. Taking the twenty years from 1863 to 1882, the average increase is 4,150 miles per annum. Estimating the yearly increase from January 1, 1883, to be the same as for the last twenty years, there would be an addition of 41,500 miles in ten years to the 138,901 miles existing at that period, making a grand total of 180,401 miles. To construct these additional miles will require 10,956,000 ties annually, or for the ten years, 109,560,000—the product of 1,095,600 acres of woodland. Allowing thirty years as the period of growth for ties, this would add 3,286,800 acres to the timber reserve needful to keep up the existing roads, or a total of 18,996,570 acres. If the calculations were extended to thirty instead of ten years for the construction of new lines, then the reserve of woodland necessary to keep the existing roads in repair would be not less than 25,950,356 acres. These figures show in an impressive light the large and rapidly-increasing demands which are made upon our forests from one source alone.

N. H. E.

DECREASE OF WOODLANDS IN OHIO.

Report on the decrease of woodlands in Ohio for the period of twenty-eight years, with accompanying diagrams, showing the proportion of woodlands in Ohio at different periods, and the amount of clearings since 1853.

BY F. B. HOUGH.

The assessors of the State of Ohio have reported annually, for many years, the amount of improved land and land "unimproved." Since 1873 a distinction has been made in the latter between "woodlands" and "other unimproved."

We have, therefore, in this State a means of comparison between different periods of time not generally found in other States, excepting as shown at intervals of ten years by the census. For this reason, Ohio presents a convenient means for studying with some care, and in detail by counties, the progress of clearings, and in an inverse proportion the exhaustion of its woodlands. It is not at all probable that this State reveals any exceptional conditions in these respects from what would be found in all of the Northern and Northeastern States, and its selection for the present illustration is due entirely to the convenient opportunities afforded by an annual official statement, in addition to the facts reported by the census.

In January, 1879, his excellency Governor R. M. Bishop, in his message to the general assembly of Ohio, in speaking of the preservation of the forests, said:

> I deem it important to call your attention to the necessity of providing by law for the protection of forests and timber. The statistics for 1877 show that in 1870 there were 9,799,333 acres of timber land in the State; that in 1877 there were 5,117,310 acres of timber land in the State. If these statistics were correct, there was, within seven years, a destruction of over four and a half million acres of forest. The day is not far distant when, if the present annual rate of destruction is continued, the beautiful and valuable forests of our State will soon disappear.
>
> In many countries in Europe the advantage of forests has been learned in the school of necessity, and now the study of forestry is taught with as much thoroughness and care as is the study of other sciences, while the cutting and replanting of trees is regulated and enforced by systematic and careful legislation.
>
> In Ohio the question is each year becoming more important, and it is now time, in my opinion, when the preservation of forests should become a subject of legislation, and that carefully prepared statistics should be annually collected, showing the area and condition of our forests.

No legislation resulted from this advice, and five years have passed since the warning was given. It is proper for us to consider upon what grounds these statements were made, and what has been the tendency towards further clearings since that date. The latest annual return of assessors at hand is that for 1881, as reported in the statistical returns printed in 1882. Placing these by the side of those of 1870 and those of 1853 we find the comparison as follows:

Area of woodland in Ohio, and the percentage of this area to the total amount of land reported by the assessors at three periods, with intervals of seventeen and eleven years between them.

Counties.	Acres of forest.			Percentage of total area.		
	1853.	1870.	1881.	1853.	1870.	1881.
Adams	280,213	135,201	86,888	91.06	43.93	34.05
Allen	191,164	128,809	60,698	74.56	50.25	31.09
Ashland	107,596	75,190	47,866	40.92	28.60	20.71
Ashtabula	222,988	143,490	63,700	50.75	32.66	17.13
Athens	204,598	146,692	57,437	66.88	47.95	19.15
Auglaize	196,356	137,509	60,720	79.25	55.51	30.94
Belmont	140,046	97,179	57,994	41.51	28.81	19.59
Brown	159,719	103,889	52,185	52.28	34.00	20.27
Butler	100,671	64,975	36,198	34.71	22.40	18.70
Carroll	85,026	63,356	45,117	33.99	25.33	20.29
Champaign	112,143	81,050	62,667	42.28	30.56	23.97
Clarke	98,813	60,560	32,062	39.63	24.35	16.13
Clermont	441,488	72,502	37,935	50.00	25.62	17.81
Clinton	112,088	80,740	40,676	48.35	31.65	18.51
Columbiana	133,793	88,505	56,290	39.55	26.18	20.77
Coshocton	169,785	123,683	69,967	48.10	35.03	23.79
Crawford	114,535	76,714	43,111	45.20	30.42	20.73
Cuyahoga	114,372	85,652	25,748	41.65	31.19	12.97
Darke	256,200	172,906	82,040	68.08	45.86	26.79
Defiance	224,327	173,283	72,125	87.14	67.29	39.35
Delaware	156,688	96,665	50,234	55.31	34.12	21.13
Erie	57,550	43,409	13,862	36.51	27.53	11.40
Fairfield	125,772	84,404	50,219	39.75	26.67	17.93
Fayette	131,004	74,637	32,495	52.43	29.85	15.33
Franklin	165,409	103,908	38,346	49.29	30.96	15.52
Fulton	206,948	147,886	62,788	80.51	57.51	30.23
Gallia	192,497	126,045	59,523	66.99	43.87	26.49
Geauga	99,992	63,458	45,818	35.89	24.75	20.93
Greene	116,568	72,531	40,798	44.02	28.04	18.41
Guernsey	115,106	107,457	65,244	47.51	32.90	22.71
Hamilton	88,123	34,473	12,954	37.70	14.76	10.94
Hancock	235,898	161,055	80,713	69.82	47.77	27.77
Hardin	241,447	182,202	61,479	86.82	64.72	30.05
Harrison	96,580	65,375	41,442	37.65	25.48	19.12
Henry	183,475	118,240	60,073	61.00	45.11	38.13
Highland	168,334	107,490	65,095	48.64	31.04	21.69
Hocking	181,391	125,223	64,323	68.18	47.08	29.05
Holmes	95,224	105,508	56,888	37.81	41.89	15.53
Huron	155,284	89,519	44,434	50.73	29.29	16.42
Jackson	195,411	109,070	42,637	75.00	41.86	20.48
Jefferson	107,093	87,440	51,801	41.51	33.95	23.09
Knox	143,968	92,251	62,241	43.69	28.01	21.68
Lake	50,745	32,828	18,657	36.88	23.86	17.45
Lawrence	245,655	194,516	88,213	88.25	68.88	19.73
Licking	181,718	111,861	66,575	42.52	26.18	17.45
Logan	142,139	120,823	58,421	50.53	42.95	25.42
Lorain	180,107	84,999	42,030	59.28	27.97	16.64
Lucas	163,023	131,235	26,519	81.00	65.50	26.18
Madison	132,999	90,612	24,659	45.45	30.96	11.75
Mahoning	96,100	68,754	41,537	30.50	28.15	20.15
Marion	130,142	90,359	39,480	51.28	35.61	19.66
Medina	76,840	60,938	43,237	29.39	23.31	18.44
Meigs	191,213	121,416	58,049	73.25	46.51	28.04
Mercer	209,027	177,235	85,722	76.67	63.58	38.58
Miami	120,822	82,621	33,350	47.81	32.69	18.15
Monroe	159,407	115,564	69,413	55.38	40.13	27.23
Montgomery	104,056	68,340	37,766	36.53	24.01	16.33
Morgan	136,465	90,038	51,658	52.38	34.57	23.13
Morrow	119,820	78,406	45,812	47.38	30.97	20.68
Muskingum	189,605	127,962	68,560	45.54	30.67	19.98
Noble	124,875	78,303	45,358	49.17	30.83	19.40
Ottawa	151,428	119,059	27,790	93.00	73.09	25.84
Paulding	251,825	230,240	53,068	96.83	88.81	51.74
Perry	101,885	69,968	39,709	39.77	27.31	18.94
Pickaway	143,719	89,281	41,909	46.13	28.66	15.80
Pike	184,724	140,984	71,612	73.52	56.09	37.45
Portage	102,904	76,600	49,474	33.03	24.59	18.22
Preble	121,619	82,785	52,976	45.62	31.06	22.35
Putnam	265,072	216,320	83,844	87.98	71.81	39.13
Richland	127,173	88,797	62,549	41.27	28.81	22.85
Ross	214,485	161,089	102,206	48.73	38.38	30.26
Sandusky	163,213	110,156	49,352	63.85	43.07	22.92
Scioto	233,493	197,937	62,548	77.77	65.94	34.89
Seneca	171,980	117,151	65,128	49.81	33.93	21.96
Shelby	180,220	120,282	61,709	70.33	46.91	24.25

Area of woodlands in Ohio, and the percentage of this area to the total amount of land reported by the assessors at three periods, &c.—Continued.

Counties.	Acres of forest.			Percentage of total area.		
	1853.	1870.	1881.	1853.	1870.	1881.
Stark	114,544	75,222	62,842	32.24	21.17	17.28
Summit	82,028	59,078	29,859	32.95	23.72	14.52
Trumbull	157,675	115,932	67,032	40.32	29.65	20.15
Tuscarawas	153,658	106,525	61,178	43.00	29.81	19.85
Union	187,958	131,573	44,993	69.00	48.40	13.30
Van Wert	236,088	186,408	76,448	91.30	71.11	43.59
Vinton	194,332	152,873	65,878	75.33	59.25	35.26
Warren	100,903	61,567	30,316	40.00	24.40	15.85
Washington	269,357	179,289	97,914	68.62	45.66	30.58
Wayne	154,676	94,933	58,726	45.20	27.40	20.50
Williams	201,113	145,051	64,529	75.96	54.76	29.55
Wood	337,760	267,946	86,067	88.19	69.98	34.92
Wyandot	161,476	115,336	72,585	63.17	45.13	28.75
Total	18,991,228	9,749,333	4,722,102	55.27	28.51	22.53

NOTE.—The columns headed "Acres of forest," for 1853 and 1870, with the percentages accompanying them, are copied from the "Annual report of the Secretary of State" for 1877, pp. 550, 551.

The column for 1881 is from this report of 1882, pp. 609, 610. The latter gives the area of agricultural lands of the State as follows: Cultivated, 9,388,018 acres; pasture, 5,869,933; woodland, 4,708,247; lying waste, 601,136; total, 20,731,093. In Knox County the woodlands were omitted and evidently included in the column of "lands lying waste" (62,241 acres). Placing this amount in the column of woodlands, we have a total as above given.

In addition to these statistics derived from official returns, we have the information obtained through an entirely independent system of inquiries, under the authority of the General Government, but leading to very similar results. These data are afforded by the national census.

It is to be remarked concerning the returns given by the census (excepting in 1870 and 1880), that the division of lands into "improved" and "unimproved," does not enable us to ascertain how much of the latter class was actually "woodland," and how much "lying waste." But to render the comparison as nearly trustworthy as the circumstances will admit, we have for the years 1870, and 1880, confined the separate items of "unimproved" into one column, and in the first of the following tables given the total number of acres "unimproved," thus rendering their import strictly similar to the returns of the two preceding periods.

It is moreover to be noticed that the census reports only the land "in farms," and it has at various times, and in many of the counties, included but a part of the woodland. This will explain the reason why the amount in many cases falls far short of that returned by the assessors. But the amount of wild lands in Ohio belonging to non-residents has rapidly diminished within the period between the first and the last of the census years included, and is now probably very small; the census of 1880 should be nearly complete, so far as it shows the area of land under its several classes.

The percentages in the following table have been computed for each county, and for each period, by using the sum of the number of acres as the divisor, so that the relative, if not the actual percentages, are as nearly exact as the data will admit.

Acres and percentages of unimproved lands in farms in Ohio, by counties, in 1850, 1860, 1870, *and* 1880, *as shown by the national census for these years.*

Counties.	Acres.				Percentage.			
	1850.	1860.	1870.	1880.	1850.	1860.	1870.	1880.
Adams	117,107	124,298	130,900	136,566	52.79	45.65	47.29	41.41
Allen	87,259	114,754	103,938	80,684	64.22	53.74	26.00	34.71
Ashland	98,662	80,290	66,586	59,121	40.52	32.91	25.45	22.81
Ashtabula	88,841	78,786	92,635	99,621	33.33	29.00	25.45	23.05
Athens	103,109	123,170	113,069	90,264	55.65	48.73	42.38	30.62
Auglaize	93,170	102,913	93,541	83,863	65.86	57.05	49.67	34.15
Belmont	130,296	97,783	89,173	77,550	42.03	35.34	28.72	22.07
Brown	110,021	109,970	84,970	74,837	46.00	39.90	29.82	24.43
Butler	102,004	100,048	52,466	55,563	37.18	32.48	21.54	18.89
Carroll	92,950	72,429	71,762	54,107	39.70	30.88	28.16	21.80
Champaign	108,564	91,400	82,006	59,753	42.43	28.45	33.98	23.52
Clarke	80,038	74,052	53,362	48,519	35.93	31.97	24.33	19.39
Clermont	90,673	102,470	60,971	52,352	40.72	37.56	24.58	18.59
Clinton	96,517	90,753	63,784	52,261	46.19	37.21	28.48	19.40
Columbiana	115,161	100,203	82,159	78,632	39.95	34.19	27.04	23.56
Coshocton	152,386	123,283	112,751	87,908	45.23	39.38	33.79	25.00
Crawford	63,120	87,224	68,033	59,416	43.24	37.95	30.21	24.13
Cuyahoga	78,153	64,440	42,139	43,309	37.46	26.80	17.56	16.21
Darke	140,154	135,108	137,600	110,021	57.64	47.76	41.34	30.32
Defiance	27,166	93,348	90,516	101,570	59.46	64.25	52.12	44.55
Delaware	111,538	97,466	81,118	67,359	50.47	39.87	29.91	23.66
Erie	39,442	39,172	20,451	22,471	31.49	26.84	14.64	14.98
Fairfield	113,155	95,744	93,453	69,593	37.18	32.70	30.55	22.00
Fayette	84,905	48,292	63,246	42,196	40.80	22.18	25.82	17.37
Franklin	105,206	95,500	70,771	62,959	40.64	33.22	26.01	19.02
Fulton	57,762	73,104	80,454	84,978	60.27	50.63	46.49	35.65
Gallia	132,831	116,339	104,203	80,517	61.62	52.09	40.67	28.82
Geauga	69,686	56,253	53,876	52,893	34.05	27.06	22.67	20.58
Greene	108,589	76,360	62,630	51,765	45.20	34.13	27.46	20.74
Guernsey	148,120	20,249	100,194	78,304	45.61	9.89	32.46	22.28
Hamilton	72,883	72,831	42,125	33,863	34.60	30.53	21.06	16.01
Hancock	113,475	124,772	128,976	120,080	58.34	46.26	43.41	35.75
Hardin	64,588	82,622	88,809	103,309	62.86	54.42	48.19	38.54
Harrison	91,102	73,611	55,052	53,362	40.60	31.81	25.90	17.79
Henry	38,158	59,178	89,205	78,202	77.42	65.31	60.71	42.19
Highland	136,290	121,427	89,039	79,888	44.56	37.67	28.90	23.50
Hocking	82,826	114,905	104,801	78,098	58.19	52.37	44.43	30.80
Holmes	107,567	86,578	85,035	68,471	42.80	36.11	34.56	27.18
Huron	99,734	85,156	66,748	51,701	40.19	30.87	25.20	17.11
Jackson	93,963	91,425	74,655	67,930	56.61	47.00	36.52	28.56
Jefferson	91,448	79,814	76,917	70,393	30.34	36.07	31.63	28.99
Knox	131,094	109,520	91,786	72,046	43.93	35.45	27.45	21.59
Lake	45,969	30,982	31,794	28,736	34.22	23.10	22.62	20.19
Lawrence	31,638	76,830	82,028	117,680	64.88	54.73	53.76	50.00
Licking	167,984	43,623	99,359	84,426	41.80	13.39	26.03	18.42
Logan	119,036	101,932	98,445	83,154	54.93	42.78	40.87	30.85
Lorain	90,262	81,697	69,139	58,884	41.51	31.24	23.23	17.29
Lucas	42,646	55,405	48,806	43,770	58.61	50.30	43.00	30.70
Madison	96,605	71,363	44,048	44,790	37.90	27.98	19.98	15.48
Mahoning	86,746	69,838	63,074	58,211	37.74	29.61	25.91	23.12
Marion	67,635	85,503	71,662	54,7..	36.19	38.71	32.70	20.85
Medina	76,617	73,701	55,795	51,443	34.62	29.11	22.34	19.25
Meigs	87,415	83,796	100,956	78,675	60.04	50.58	44.72	29.32
Mercer	48,258	102,624	113,500	104,596	64.83	56.38	50.78	40.46
Miami	94,907	88,602	66,319	51,683	45.44	37.29	28.87	21.44
Monroe	164,349	124,880	118,619	87,618	56.98	46.71	40.24	31.19
Montgomery	109,233	89,211	68,172	55,111	41.92	32.44	26.52	24.70
Morgan	137,183	103,769	84,040	70,207	50.64	42.90	34.48	23.67
Morrow	83,951	92,594	74,288	62,447	46.66	38.00	30.63	24.32
Muskingum	157,796	131,475	120,838	93,293	42.56	38.86	31.35	23.84
Noble	.....	101,918	72,364	62,201	.....	41.85	30.46	23.84
Ottawa	16,513	36,358	48,515	50,628	55.65	51.95	54.67	40.89
Paulding	5,566	28,591	46,274	73,274	56.89	67.01	65.98	55.22
Perry	78,707	91,633	73,801	49,130	43.16	37.38	29.34	19.63
Pickaway	113,300	61,595	82,587	55,512	41.41	26.54	24.14	17.76
Pike	75,386	112,772	96,414	103,539	52.51	55.51	48.32	40.62
Portage	88,273	75,882	66,725	69,850	35.19	24.73	24.03	22.54
Preble	114,065	115,099	79,551	68,470	46.71	43.88	31.93	26.48
Putnam	49,467	109,899	94,943	104,970	65.20	63.00	55.00	43.76
Richland	119,202	104,304	129,159	77,432	42.28	34.63	37.90	24.80
Ross	130,557	149,928	109,895	115,953	42.17	38.55	33.90	28.57
Sandusky	77,885	51,671	84,761	67,738	51.68	39.55	37.39	27.61
Scioto	75,235	76,749	82,379	137,579	60.32	48.84	49.19	49.88
Seneca	131,822	118,491	101,729	86,034	46.35	39.49	31.93	25.83
Shelby	86,791	103,698	98,541	83,832	58.07	52.59	44.00	32.97
Stark	124,173	102,313	76,171	62,066	37.55	31.27	23.67	18.13
Summit	77,400	60,134	51,580	48,373	32.79	25.67	23.13	16.64

Acres and percentages of unimproved lands in farms in Ohio, by counties, &c.—Continued.

Counties.	Acres.				Percentages.			
	1850.	1860.	1870.	1880.	1850.	1860.	1870.	1880.
Trumbull	125,026	104,325	93,773	85,911	37.26	31.07	26.89	21.69
Tuscarawas	120,340	102,894	97,504	82,550	43.65	32.25	29.08	22.00
Union	92,215	87,527	89,689	72,688	54.28	41.13	39.00	27.55
Van Wert	30,229	77,402	92,301	91,712	67.05	61.46	56.09	42.63
Vinton	77,981	113,782	76,220	78,922	59.40	59.83	44.58	34.27
Warren	99,777	99,464	60,040	49,492	41.00	31.69	25.39	20.39
Washington	150,685	175,756	146,659	94,713	60.70	73.70	44.29	27.27
Wayne	130,906	84,097	85,589	75,680	39.79	24.85	26.13	23.51
Williams	55,906	81,870	105,293	89,874	60.10	51.21	45.05	34.72
Wood	58,428	114,212	106,038	111,246	61.86	57.38	47.50	38.00
Wyandot	67,262	90,475	61,984	67,308	46.00	44.65	33.50	26.81
Total	8,146,000	7,846,747	7,243,287	6,447,997	45.27	38.82	31.98	26.26

The exceptional percentages of Guernsey, Licking, and some other counties in the preceding table can only be explained as being from manifestly defective returns, and there can be little doubt but that a full and correct statement would have shown a steadily decreasing rate in woodland areas in every county in the State.

As a further illustration of the subject, we are enabled to compare by counties, in the census returns of 1870 and 1880, the amount and proportion of "woodlands" and of "other unimproved lands," the latter term being defined in the census of 1880 as "other unimproved, including old fields not growing wood." The result is shown in the following table, by the side of the assessors' returns of 1880:

Acres and percentages of "woodlands" and of "other unimproved lands" in the several counties of Ohio, as reported in the national census of 1880, *and as compared with the returns made in the same year by the State assessors.*

Counties.	Acres of unimproved land.						Percentages of woodland.		
	1870 (census).		1880 (census).		1880 (assessors).				
	Woodland.	Other unimproved.	Woodland.	Other unimproved.	Woodland.	Other unimproved.	1870 (census).	1880 (census).	1880 (assessors).
Adams	133,107	3,193	127,259	9,397	91,888	13,238	46.22	38.59	34.69
Allen	103,109	1,829	82,526	4,158	63,985	1,842	45.74	33.05	30.67
Ashland	64,419	2,167	57,155	1,966	50,813	2,120	25.16	22.00	21.37
Ashtabula	91,203	1,432	89,198	10,423	71,620	6,933	25.06	20.46	20.89
Athens	112,406	663	88,403	1,861	62,291	4,473	42.14	29.89	26.31
Auglaize	88,568	4,973	78,888	4,975	63,008	1,230	47.03	32.31	32.87
Belmont	87,254	1,919	70,853	6,697	60,109	14,882	28.12	20.69	20.36
Brown	83,171	1,799	64,509	10,328	53,238	11,136	29.20	21.90	19.94
Butler	51,234	1,232	47,083	8,480	29,985	9,785	21.04	15.10	14.87
Carroll	70,937	825	53,285	912	45,092	745	27.83	21.43	20.38
Champaign	70,003	11,973	55,587	4,166	62,667	.....	28.49	21.87	23.97
Clarke	52,168	1,194	41,414	7,105	39,134	2,117	24.24	16.41	19.55
Clermont	60,060	911	44,229	8,123	42,987	23,102	24.21	16.97	17.01
Clinton	64,477	1,287	50,851	1,410	39,243	2,884	27.90	19.25	19.71
Columbiana	79,328	2,836	72,772	5,860	59,996	5,136	26.10	21.79	21.46
Coshocton	106,616	6,135	86,391	1,607	72,871	4,089	31.90	24.51	23.49
Crawford	65,271	2,762	57,000	2,405	46,753	1,298	29.00	23.16	21.98
Cuyahoga	41,449	693	35,909	7,400	26,276	4,654	17.29	13.45	13.53
Darke	132,500	5,100	107,567	2,454	85,740	7,900	39.84	29.65	27.53
Defiance	89,997	519	97,331	4,239	77,828	2,053	51.82	42.69	39.98
Delaware	79,926	1,192	63,548	3,811	51,354	3,086	29.53	21.62	21.91
Erie	18,374	2,077	18,488	3,968	14,908	6,302	13.34	12.32	13.17

Acres and percentages of "woodland," and of "other unimproved lands," &c.—Continued.

Counties.	Acres of unimproved land.						Percentages of woodland.		
	1870 (census).		1880 (census).		1880 (assessors).				
	Woodland.	Other unimproved.	Woodland.	Other unimproved.	Woodland.	Other unimproved.	1870 (census).	1880 (census).	1880 (assessors).
Fairfield	91,708	1,744	60,147	9,446	50,820	6,378	29.90	19.01	18.76
Fayette	61,646	1,600	41,331	865	33,021	1,463	25.17	16.70	15.46
Franklin	68,478	2,293	56,594	6,365	38,867	7,234	25.17	17.27	16.79
Fulton	77,624	2,330	77,827	7,151	64,241	3,964	44.85	32.65	31.21
Gallia	100,137	4,156	76,600	4,917	61,982	10,477	39.05	27.49	27.97
Geauga	52,521	1,355	50,176	2,717	42,720	1,576	22.20	19.52	19.42
Greene	57,675	4,955	49,505	1,660	40,241	1,571	25.28	20.07	18.37
Guernsey	97,298	2,896	76,592	1,712	62,241	1,571	31.51	21.79	22.27
Hamilton	40,275	1,850	28,729	5,134	14,628	6,211	20.12	13.30	12.13
Hancock	122,409	6,567	114,026	6,054	89,278	3,381	41.20	36.90	30.20
Hardin	85,438	3,371	93,051	10,258	59,358	6,270	46.35	30.98	28.87
Harrison	53,217	1,835	50,948	2,414	44,199	250	25.04	16.98	19.39
Henry	78,149	11,056	74,847	8,355	56,224	1,262	53.31	40.30	37.71
Highland	87,559	1,480	76,925	2,961	66,322	8,589	28.27	22.61	21.58
Hocking	104,024	777	72,290	5,808	58,896	22,509	44.09	28.57	27.93
Holmes	84,540	495	66,381	2,090	52,281	3,402	34.85	26.39	23.22
Huron	61,799	4,949	43,383	8,318	47,385	6,211	23.33	14.86	17.21
Jackson	74,268	387	59,836	8,094	46,900	19,154	36.34	25.16	22.02
Jefferson	75,656	1,261	64,831	5,562	51,352	3,870	31.12	26.70	23.85
Knox	91,269	517	70,286	1,760	58,889	1,923	27.29	21.05	20.27
Lake	30,576	1,218	23,618	5,118	19,011	1,872	22.71	16.59	17.80
Lawrence	69,301	12,727	103,233	14,447	41,198	18,977	44.57	43.93	27.03
Licking	94,195	5,164	79,709	4,719	73,403	3,453	24.92	17.39	19.44
Logan	94,304	4,141	79,298	3,856	57,480	3,429	38.67	29.43	26.60
Lorain	66,908	2,231	52,515	6,369	42,505	5,016	22.48	15.50	15.81
Lucas	47,559	1,247	38,606	5,164	27,737	4,401	41.81	27.08	24.88
Madison	42,513	1,535	43,700	1,090	30,014	838	19.25	15.10	13.61
Mahoning	61,981	1,093	54,401	3,810	46,823	1,943	25.50	21.61	19.56
Marion	62,165	9,498	51,755	2,974	46,774	1,292	28.52	19.67	22.24
Medina	54,092	1,708	47,057	4,386	41,475	2,484	21.66	17.61	17.45
Meigs	99,743	1,213	73,736	4,939	61,199	8,657	44.02	27.51	28.13
Mercer	111,881	1,619	101,852	2,744	82,467	2,682	50.05	39.40	39.07
Miami	64,807	1,512	48,039	3,044	37,879	3,320	28.21	20.17	19.16
Monroe	111,946	6,673	81,681	5,938	68,737	9,189	37.97	29.80	27.73
Montgomery	65,635	2,537	50,569	4,542	40,810	6,620	25.54	18.71	16.87
Morgan	82,091	1,949	61,039	9,168	56,434	5,337	33.69	21.40	23.98
Morrow	69,093	5,195	56,614	5,833	48,687	1,429	28.49	21.45	21.28
Muskingum	115,880	4,958	90,506	2,787	79,303	7,098	30.03	24.31	18.91
Noble	72,217	147	58,492	3,709	43,614	3,961	30.40	22.31	18.38
Ottawa	41,904	6,611	36,894	13,744	30,753	8,766	47.33	29.08	28.18
Paulding	42,082	4,192	70,653	2,621	53,689	9,292	60.01	53.25	50.23
Perry	71,643	2,158	47,543	1,587	43,012	2,230	28.47	18.99	20.79
Pickaway	68,821	13,766	51,641	3,871	44,033	10,472	20.11	16.42	16.03
Pike	96,088	326	98,363	5,176	72,663	5,232	43.16	38.05	26.68
Portage	62,683	4,042	57,907	11,943	49,878	6,758	22.84	18.69	18.31
Preble	76,081	3,470	65,584	2,886	55,485	7,458	30.54	25.36	22.90
Putnam	89,932	5,011	100,133	4,837	87,398	5,009	52.10	41.75	41.53
Richland	88,582	40,577	73,399	4,032	59,592	3,079	26.04	23.60	23.31
Ross	93,978	15,917	106,370	9,583	89,700	31,089	28.86	26.70	25.98
Sandusky	80,852	3,909	61,558	6,180	49,542	6,480	36.05	25.00	23.69
Scioto	80,908	1,471	121,646	15,933	56,309	22,743	48.31	44.17	31.05
Seneca	98,541	3,188	81,315	4,719	72,309	1,782	30.92	24.42	24.01
Shelby	92,272	6,269	79,896	3,936	56,857	2,993	42.30	31.40	29.08
Stark	69,559	6,612	57,200	4,806	43,791	5,874	21.60	16.72	12.56
Summit	45,911	5,619	40,242	8,131	31,693	8,784	20.60	15.51	14.59
Trumbull	89,444	4,329	78,633	7,278	64,801	3,220	25.60	19.85	20.28
Tuscarawas	97,023	481	76,878	5,672	66,018	9,973	28.94	20.49	21.19
Union	72,131	17,558	70,519	2,189	48,403	1,865	31.39	26.82	19.66
Van Wert	82,885	9,416	89,625	2,087	68,667	9,056	51.12	41.66	39.45
Vinton	72,385	3,835	72,476	6,446	53,214	17,464	42.33	34.44	29.16
Warren	56,860	3,180	46,172	3,370	33,260	6,222	24.06	19.44	16.78
Washington	146,100	559	86,677	8,086	93,264	11,536	44.11	24.95	28.38
Wayne	82,807	2,782	72,180	3,500	61,918	9,225	25.28	22.43	20.76
Williams	102,671	2,662	88,526	6,348	88,661	2,928	43.93	32.27	31.87
Wood	94,554	11,484	105,614	5,634	84,455	2,856	42.34	36.80	34.76
Wyandot	61,101	883	59,188	8,120	72,585	1,828	33.04	23.56	28.76
Total	6,883,575	359,712	5,962,398	465,599	4,828,686	560,721	31.73	24.39	23.34

To render the facts shown by these statistics more striking we have constructed a series of graphic illustrations.

In the first of these the percentages for the whole State and for each county are represented by a series of colored bars, the horizontal distance between the sides of the diagram representing 100. The percentages are placed according to their value, and colored according to the numbers they represent. The portion of each bar left white shows the relative amount of improved land prior to 1853.

In the second diagram the percentages of woodland in 1881 and the amount of clearings between the periods mentioned are shown by angular spaces, the most convenient of all methods for showing the relations of parts to a whole. The white portion in each circle shows the amount of cleared land in 1853; the red the relative amount cleared from 1853 to 1870, and the brown the amount cleared from 1870 to 1881.

Finally, in the third diagram is shown upon two consecutive circles, and for the whole State, the percentages derived from the independent statistics of the State assessors and of the national census, and will need no further explanation than that given upon the drawing.

These facts appear to fully justify the urgent appeal made by Governor Bishop in 1877, and should attract the thoughtful notice of every citizen of the State. It scarcely needs be asked "*how long the remaining woodlands can meet the demands made upon them at the present rates?*"

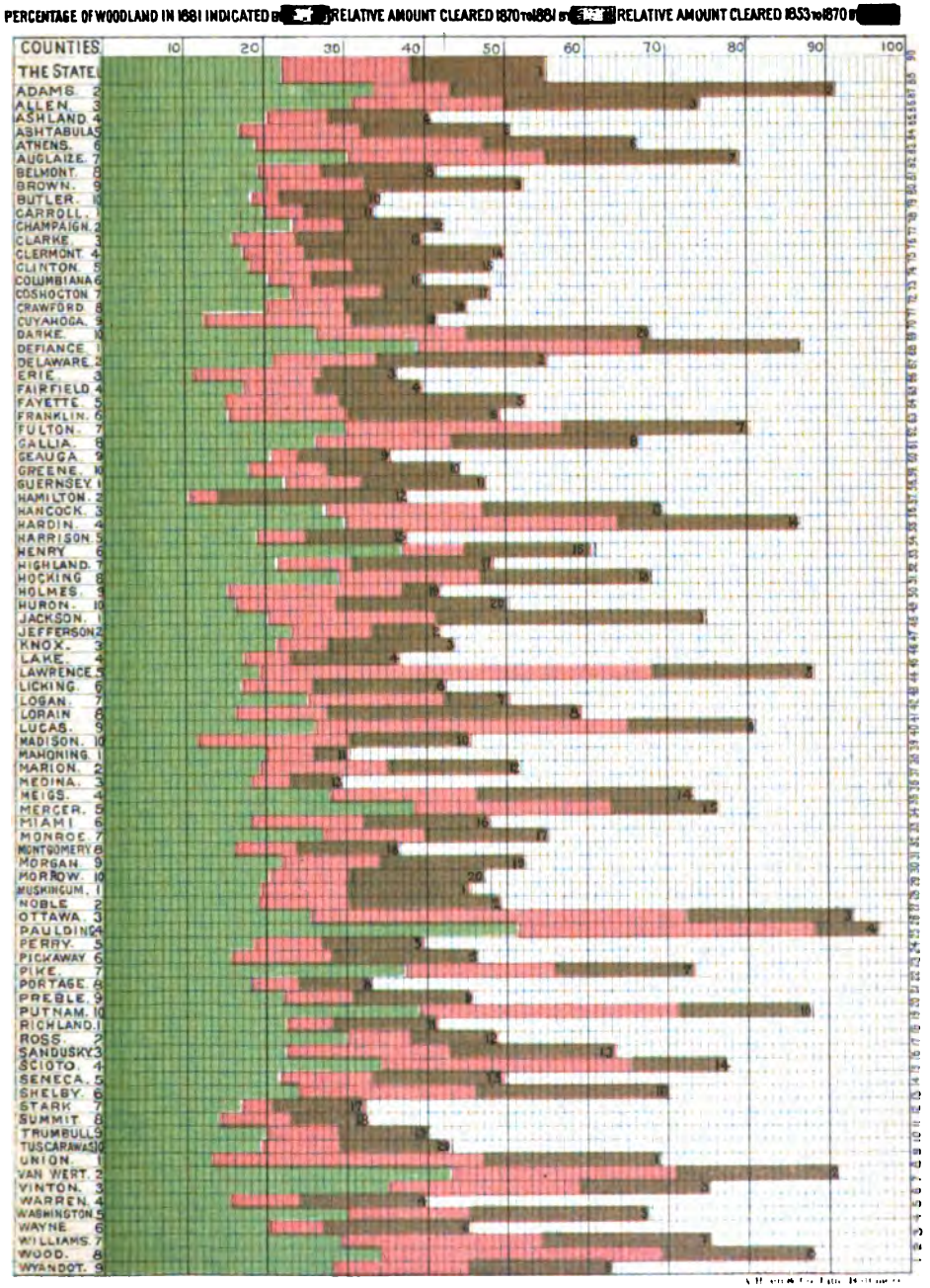
Unless there is some grave error in the data (the general correctness of which we have not seen questioned) there can be no subject presenting stronger claims for immediate attention, and the longer it is neglected the more serious it becomes.

BRIEF SUMMARY.

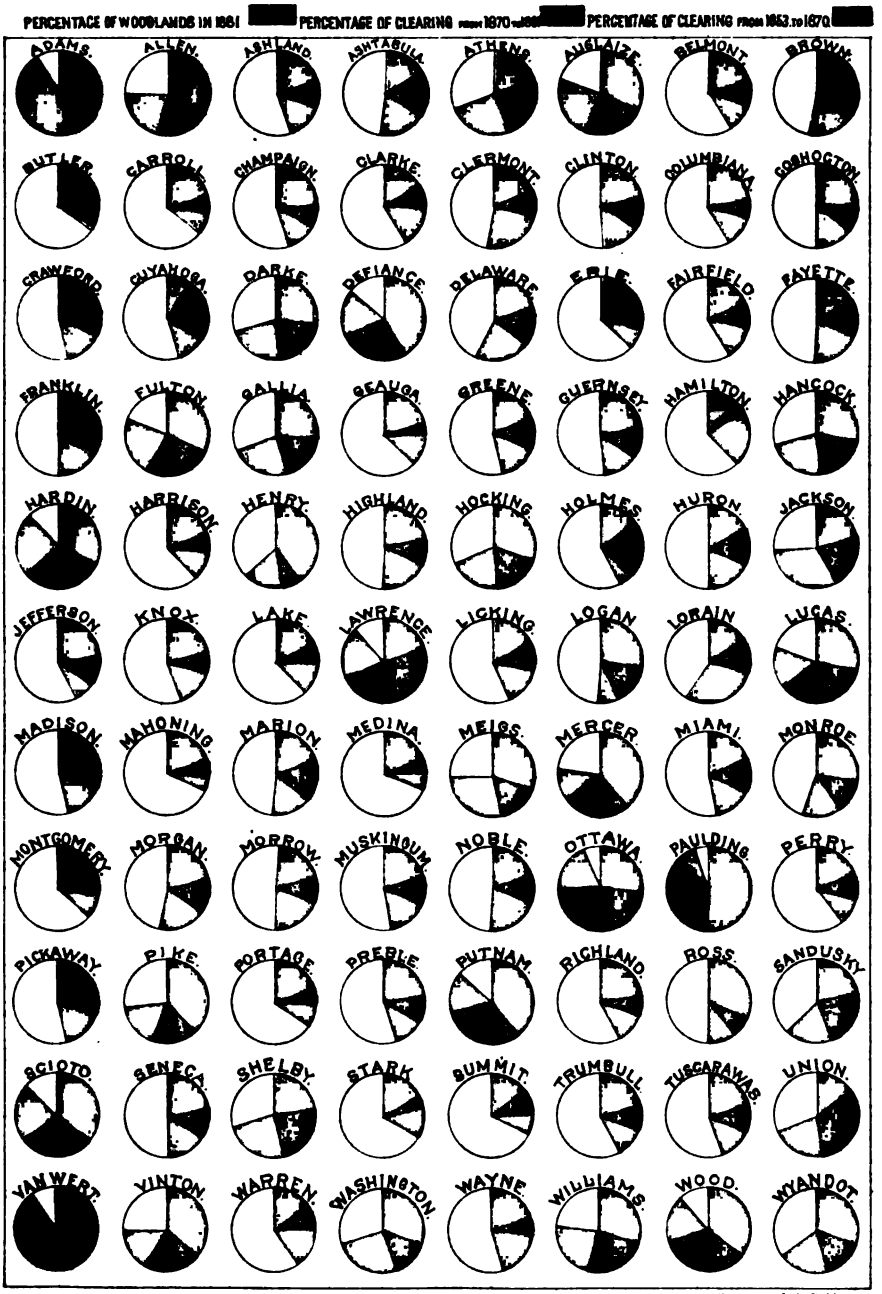
Total amount of woodland in Ohio:	Acres.
Census of 1870	6,883,575
Census of 1880	5,992,507
Assessors' estimate	4,828,686

No. 1.

DIAGRAM showing by comparison the per centage of Woodlands in Ohio, by counties, in 1881, and the relative amount of clearing in each county from 1870 to 1881, and from 1853 to 1870, as reported by Assessors.



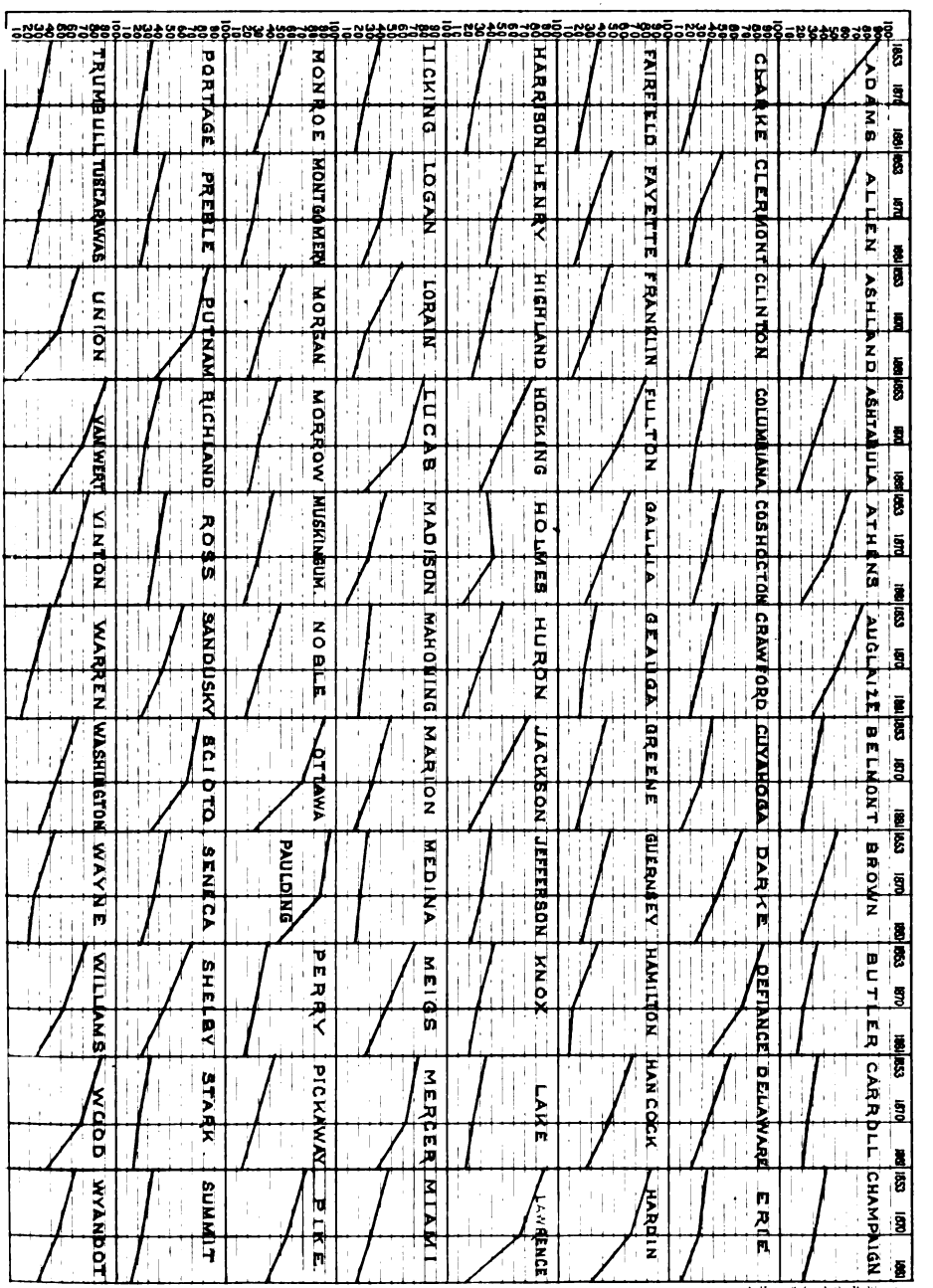
No. 2. DIAGRAM showing the proportions of Woodlands in the several counties of *Ohio*, in 1881, and the relative amount of clearing between the years 1853 and 1870, and between 1870 and 1881, as shown by the returns of Assessors, under the State Laws.



UNIV. OF MICH.

DIAGRAM showing by comparison the per centage of Woodlands in Ohio, by counties, in 1881, and the relative amount of clearing in each county from 1870 to 1881, and from 1853 to 1870, as reported by the State Assessors.

No. 4. The horizontal red lines and perpendicular black lines define the counties. The heavy black lines running crosswise represent the percentage of Woodland at the periods mentioned, thus: Adams county had 91.06% of Woodland in 1853, which is the beginning point of the black line. In 1870 it had 43.93% of Woodlands, which is designated by the crossing at the perpendicular red line, and in 1881, 34.05%, and is the end of the line.



REPORT BY STATES RESPECTING THEIR FOREST CONDITION.

By F. P. BAKER, *Agent of the Department.*

In July, 1883, the following blank was prepared and sent out by the agents of the Department to all parts of the country. From the returns made to those distributed in the field assigned to him, Mr. F. P. Baker makes the following report:

CIRCULAR A.

DEPARTMENT OF AGRICULTURE.

FORESTRY DIVISION.

To ——— ———:

The Department of Agriculture having been directed by Congress to make certain investigations in reference to *Forestry*, the undersigned has been instructed by the honorable George B. Loring, Commissioner of Agriculture, to prosecute inquiries upon certain points having reference to this subject in several of the United States, including the one to which this circular is addressed.

In pursuance of this work, you are respectfully requested to return this blank to the undersigned, at ———, with such information and suggestions as you may be able to communicate upon the subjects indicated by the inquiries which follow. Should the spaces allowed be insufficient, supplementary sheets may be used, suitable references being made to the numbers prefixed to the inquiries to which answers are given.

Very respectfully, yours,

——— ———,

Agent of the Department of Agriculture.

JULY —, 1883.

I. To what extent have the native forests been cleared off within the range of your observation (mentioning the counties or district included), and what kinds of timber are left standing, and what is their general quality? State what proportion of the county or district was formerly covered with wood.

II. For what purposes have the forests been cleared, whether for lumber, fuel, or other uses, or simply to gain land for agricultural purposes, without use of the wood? How far will the growing forests supply the place of those which have been removed?

III. What is the estimated amount of young wood growing naturally? [This amount may be stated in acres, or in percentage of the area of the district reported.]

IV. What are the possibilities and advantages of planting forest trees in your region, and to what extent are persons engaged in it?

[Any suggestions, from your own experience or that of others, in regard to the kinds of trees best adapted for cultivation in your region, or as to time and methods of planting or sowing and subsequent management, will be welcome.]

V. To what extent have the woodlands of your region been injured by forest fires?

[Any suggestions as to the causes of such fires, their prevention, or their control after they are begun, will be very acceptable.]

VI. What should the General Government do for the preservation and increase of forests on the public domain?

VII. What is the deterioration of trees in value at given ages?

[This inquiry includes an estimate as to the age at which different species of trees should be cut in order to secure their greatest value.]

Name of person reporting: ——— ———

Post-office address: ———.

Date: ——— —, 1883.

ALABAMA.

A report from Mobile says:

There has hardly been any clearing off of forests in Alabama. The forests have been cleared for the purposes of lumber and of fuel; the timber is yellow pine, and the growth of the new forest is too slow to compensate for clearing. The opinion is given that the percentage of new wood growing naturally in this part of Alabama where timber has been cut off is not over two and one-half per cent. in area. The cleared lands produce but little of the yellow pine; it mostly becomes covered with weeds and undergrowth of all sorts, and in favored districts with Bermuda grass, which is more valuable than the timber it replaces, as it is excellent pasturage nine months of the year. The elm has been transplanted from western New York to this section with success; it takes kindly to the climate and is favored by birds which destroy noxious insects. Very little appreciable damage has been done to timber lands from forest fires. To preserve and increase the forest on the public domain, attention should be given to reckless marauders and land-grabbing corporations. Differences in location of 25 rods may make a great difference in the longevity of yellow pine.

Another report from Mobile is that about one-fifth to one-fourth of the native forests remain in the counties of Baldwin, Mobile, and Washington in Alabama, and in Greene, Jackson, and Wayne Counties in Mississippi. "Boxing" the timber for turpentine renders it an easy prey to forest fires; the second growth of pine is usually inferior. Black-jack—a scrubby oak—usually replaces the pine. Probably 10 per cent. of the area is in young wood, growing naturally.

Forest fires here scarcely damage a perfect tree, but the boxing of pines destroys them, especially if the "crade" is not well scraped off, when the tree is abandoned. The Government should certainly stop depredations on its own land. Fires in this section will not harm uncut trees very much. A pine is well developed at 100 years, and does not deteriorate for a great while. In Mobile County a cypress tree 60 inches in diameter was lately sawed, making good lumber. It had 460 "rings" about the heart.

ARIZONA.

A Prescott correspondent says that section of country is well wooded, the timber being pine, oak, and walnut, and on the streams cottonwood. The pine forests are destroyed by coal-burners, yet there is much young timber growing. The forests have been cleared for fuel and for smelting ore, and there has been considerable timber shipped on the Atlantic and Pacific Railroad to Mexico. The presumption is that trees which require the least moisture could be raised in this section. Forest fires destroy many acres of young growth every year. The Government should enforce the timber law by bringing to justice the mill-men and coal-burners.

A Tucson correspondent says the mesquite, as a shrub or tree, is very generally distributed in Southern Arizona, and live-oak is found on the South Colatine Mountains, and east of the Bell Williams and San Francisco Mountains there is a large tract of very fine pine timber land.

ARKANSAS.

A Malvern correspondent says that very little of the forests in Hot Springs, Garland, and Dallas Counties has been cleared. The timber is the yellow pine of the best quality and in great abundance. The clearings have been made for agricultural purposes. An abandoned worn-out field, if left, is soon filled up with a thick growth of yellow pine. It is thought the sowing of black walnuts and pecans would be profitable. The Government ought to appoint agents to see that the existing

valuable timber is preserved, and to prevent "squatters" from settling near saw-mills and, under the pretext of homesteading, cut the timber. The pines are probably one hundred and fifty years old; they are from 1 to 3 feet in diameter, 150 feet high, and as straight as an arrow. There is no advantage in letting them stand any longer.

A White County reporter says:

For the south half of White County, 30 miles north of Little Rock, not more than 5 per cent. of the oak varieties and of hard pine has been cleared off. The pine forest is 10 miles north of Beebe, and what has been cut was for agricultural purposes. There is a great amount of first-class stave oak timber east of Beebe. Young trees seem to grow almost as fast as cut away. Almost any forest trees make rapid growth; there is no interest taken in setting them; all join in destroying. Timber trees do not burn here much, owing to the dampness of soil and the atmosphere. Trespassers should be kept off of the public domain, and timber should be cut in the winter months. When dead limbs are seen in the tops of forest trees, the trees soon become worthless, as insects work in them, and they should be cut. The worms make small holes in the trees.

COLORADO.

A Del Norte correspondent says:

The native forests in Rio Grande County are rapidly decreasing, pine and spruce being the principal kinds remaining, and originally covered about one-fourth of the country. The growing forests will cut but a small figure toward replacing that which was cut for fuel and lumber. There is a growing feeling in favor of planting trees; the cottonwood and maple thrive the best. The worst enemy of the woodlands in Colorado is the careless prospector. There is a stringent law against such firing, but it is difficult to enforce it. There is no way to stop the fire. The General Government should appoint commissioners to look after the timber culture. Give any man the land upon which he will plant trees, at least one section out of four. The cottonwood matures in from thirty to forty years; the maple in from forty to fifty years; pine and spruce in from seventy-five to one hundred years.

A Denver correspondent says:

The eastern slope of the mountains, including the counties of Laramie, Boulder, Gilpin, Clear Creek, Jefferson, Douglas, El Paso, Fremont, Lake, Park, and Chaffee, have been stripped of from two-thirds to three-fourths of their timber. The western section of the State has more timber than the eastern. The timber growing on the mountains is mostly pine and spruce. The aspen is the second growth on moist lands. In the mountains about one-twentieth of the area is timber.

The forests have been cleared for lumber, fuel for smelters and mining towns, the miners consuming a great deal of timber. If the fires are kept out, the growing forest will supply deficiency as one to sixty. The acreage of timber in Eastern Colorado has been reduced at least one-half since its first settlement.

Forest trees can be grown to great advantage under experienced management in all sections of the State where agriculture is carried on, though ignorance and carelessness on the part of the planter is the besetting sin in tree culture. A pamphlet published by the General Government, for free distribution, on the subject of forestry would be beneficial; also, a forest commissioner should be appointed in each State to instruct the people and look after the timber interests in general.

At least one-half of the woodlands have been injured by forest fires. In 1879 the Ute Indians burnt millions of acres of timber on the western slope. The General Government should enact stringent laws to prevent extravagant waste, and assess a heavy fine or imprisonment for starting fires, and provide means for stopping forest fires that have been started. For lumber used for general purposes and cabinet work, trees from thirty to sixty years of age, depending on variety, are the best.

A correspondent from Gunnison says:

None of the forests are cleared off; probably one-half is timbered. The timber has been cut to make houses, and some for fuel, though coal is pretty generally used.

The forests will grow as they have been cut, if fires are not allowed. About one-fourth of the young wood grows naturally. Planting forest trees would be unnecessary and impracticable, and is scarcely engaged in by any one. Fires have injured more woodlands than can well be estimated. They are caused by persons camping out and going from camp leaving fires burning. It would be well to prosecute and punish some person thus leaving fire, yet it would be unpopular. If only no fires were allowed, in a few years there would be good timber growing up again from small trees. The growth of trees is about uniform from commencement to the end.

A Colorado Springs reporter submits quite extended statements concerning forestry in El Paso County; questions, with an abstract of the answers to the same, being herewith presented:

1. To what extent have the native forests been cleared off within the range of your observation, mentioning the counties or district included, and what kinds of timber are left standing, and what is their general quality? State what proportion of the county or district was formerly covered with wood.

The county of El Paso was formerly covered by forests for about one-quarter of its mountainous area. The cottonwood along the water-courses was the only tree on the plains. About one-quarter of the forest area is now standing, and may be computed at 100,000 acres.

Fir, pine, and spruce are the varieties of its timber, and are rated at about one-half that of Michigan, Minnesota, and Wisconsin for purposes of lumber. Except for mining, the cottonwood is useless for economical purposes, but it has been largely transplanted to towns, where, with care and irrigation, it thrives better than in its native habitat.

2. For what purposes have the forests been cleared; whether for lumber, fuel, or other uses, or simply to gain land for agricultural purposes, without use of the wood? How far will the growing forests supply the place of those which have been removed?

About one-quarter of the area of the cleared forest land in this county has been destroyed by fire. The remainder, or one-half of the whole area of forests, has been cleared for fuel and mineral purposes, and chiefly for lumber and railroad ties. As nothing can be grown without irrigation, and as this is confined to the water-courses on the plains, no land has been cleared for agricultural purposes.

It is estimated that the young growing forests will supply the place of those now standing, but they will not be ready for use before a generation or two.

3. What is the estimated amount of young wood growing naturally? This amount may be stated in acres or in percentage of the area of the district reported.

About 6 per cent. of the area of the county is young forest. The conifer seeds here come to maturity only every six or eight years; therefore all groves are about the same age, having been sown at nearly the same time.

4. What are the possibilities and advantages of planting forest trees in your region, and to what extent are persons engaged in it? (Any suggestions from your own experience or that of others in regard to the kinds of trees best adapted for cultivation in your region, or as to time and methods of planting or sowing and subsequent management, will be welcome.)

Planting can only be done with irrigation, and little can be spared from the limited amount of irrigable land, which is wanted more for agricultural and horticultural purposes. Something might be done in some of the moister valleys and gulches of the mountains by planting seed, but this has received no encouragement, and nothing will be done until the State and General Governments offer some inducements.

In 1876 there was a movement to encourage forestry, and the State constitution provides for the care of the trees and for new planting.

A memorial to Congress was presented from this State, tending to the preservation of the forests on the public domain, and the increase of forest culture, but nothing practical has been done. In the mountains there are many places well protected from winds and too much sun, where there is a sufficient degree of moisture to enable trees to grow.

Here, a systematic planting of seeds could be carried on with good results, but it must be done by the State or General Government, if done at all. A system that obtains in Europe would be useful here.

The State should be divided into districts, and salaried men of experience put in charge of them. No timber should be cut on the public lands, except by permission from them, and they should be provided with means sufficient to enable them to plant seed and keep up and increase the young forests. The cattle ranging through the mountains destroy a great deal of the young wood, but this is an element of loss that must be expected to a certain extent. Experience will give the best methods of plant-

ing and care, for certainly planting can be done in this State, in many parts of the mountains, with very nearly as much success as it is in the mountainous districts of Europe.

On the plains, at the altitude of six to eight thousand feet, the drying winds, the hot sun in summer, the changes from intense cold at night to a high degree of heat at noon, the rarity of the atmosphere causing rapid evaporation from every part of the tree, the lack of moisture, which renders it difficult for the tree to keep up proper circulation with such rapid evaporation—these combining influences, antagonistic to vegetation, operate to prevent trees from thriving in this climate. We have all the species of poplar, except the Lombardy, but the box-elder is our best native tree for ornamental planting.

The silver maple seems to be the only maple that does well. The American elm grows successfully, also the catalpa, and some varieties of the birch. The white-ash is one of the best trees we can have, and other varieties of the ash will, no doubt, do as well. Magnolias, of the American species, have succeeded on lawns, and also the ornamental varieties of the apple and cherry. The plane tree no doubt will succeed; also the pin oak and the white oak. The honey locust succeeds admirably, likewise many varieties of the willow and the mountain ash. The linden, I think, will do well. All kinds of nut trees, such as chestnut, walnut, and hickory, will thrive well on account of their long tap root, which reaches moisture where others do not, and protects the trees from our high winds. The beeches are of too slow growth, and no deciduous tree of slow growth, no matter how hardy or robust, seems to be able to get ahead in our climate. But any hardy, rapid-growing tree finds it difficult, with the short growing season, and other peculiarites of the climate, to get along without obstacles. The common varieties of the American conifers do well, but a large number of varieties of the evergreen, so useful and ornamental on lawns and in gardens in moister climates, are soon burned up here.

By planting belts of cottonwood to protect them from the dry winds, many trees may be grown that could not be otherwise cultivated. This is done to a great extent with fruit trees, which have a specially difficult time to do their duty in this climate, by reason of early warm weather in the spring and very late frosts.

The result of this planting in and around the towns, of the spreading of water by irrigation over a greater area, and by breaking up the ground, so that the water is retained in the soil, has been to increase the moisture of the climate to a very great extent. This may not be particularly noticeable in the amount of rainfall, but it is very evident in the humidity of the atmosphere.

5. To what extent have the woodlands of your region been injured by forest fires? (Any suggestions as to the causes of such fires, their prevention, or their control after they are begun, will be very acceptable.)

About one-quarter of the original forests of this country have been destroyed. The Indians fired the country to drive out the game; the miners and settlers accidentally or maliciously continue the fires. When started by carelessness they do not often gain much headway, being soon controlled by starting other fires in front of them.

6. What should the General Government do for the preservation and increase of forests on the public domain?

As I understand it, according to a late ruling of the Secretary of the Interior, timber may be taken from the public domain for domestic use, so long as it is not shipped out of the State or neighboring districts. But the miners and saw-mills are very wasteful of the timber, and often cut down trees they never use. In my opinion the General Government should appoint overseers of their timber lands and charge a certain amount for their use for business purposes, or it should give them over to the States with certain conditions providing for their care and preservation.

It might be well to offer in the State double the usual amount of land for a timber claim, on account of the difficulty and expense attending the culture of trees here.

7. What is the deterioration of trees in value at given ages? (This inquiry includes an estimate as to the age at which different species of trees should be cut in order to secure their greatest value.)

The deterioration of trees here begins at all ages, being dependent to a very large extent upon the situation, nature of the soil, and amount of moisture. Trees 8 inches in diameter will be found rotten at the core, while others 2 feet in diameter may be sound.

Those in low spots will last longest, and those on the north side of valleys and gulches where the snow will lie long and the ground is moister. On the spur, known as the divide, from which most of our timber comes, and which extends out from the mountains eastwardly into the plains, the trees grow almost entirely on the south side, being more protected there from the severe drying winds.

GEORGIA.

A correspondent from Burke County says:

One-fifth of the native forests have been cut; what is left standing is mostly pine, except the river swamps, which are composed of cypress and hard woods. The forests have been cleared mostly for timber, and the least for agricultural purposes. There would be but little advantage in planting timber in the pine belt. The yellow-pine forests would generally be in better condition to cut than if left to stand longer. Probably 15 per cent. is worthless to manufacture on account of red rot, which usually commences at the base of the tree, and is the result of old age.

A correspondent from Dalton, Whitfield County, says:

In this region the timber is being rapidly cut off and the land cultivated, which is the case in all the counties near the railroads. The timber is mostly used for lumber, and there is very little good timber standing near the railroad. Back 6 and 8 miles from the railroad the timber is plentiful and will last for the next generation. Back of the railroads a few miles two-thirds of the area of the country has young wood growing naturally. Chestnut timber could be grown rapidly, and it might be desirable to plant it and other timber for the future. The timber is fine and thrifty, as there is but little damage from fire. The Government would do well to plant chestnuts on the public domain, and they would come in quickly and be good for fencing and building materials.

INDIAN TERRITORY.

A report from Muskogee says the percentage of timber is increasing as the prairie fires are kept down, which is more plainly observable to the westward, where the timber and grass are growing better.

The kinds of timber generally used are pine and walnut. Fires do the greatest damage to timber, though the borers do some injury. The age of the pine is about fifty years; the age of the walnut when fit for use is forty years. Timber will not grow sufficiently to keep up the supply. The cultivation of black locust for posts is recommended, as they are very durable and will be ready for use at the age of ten years. Cottonwood would be ready for use in twenty-five years. To preserve and increase the forests on the public domain, it is thought advisable to offer an inducement for a 5-acre grove to be planted by the first settlers on every quarter section.

KANSAS.

Reports from Brown County show that about 25 per cent. of the original forests are left standing, the timber consisting of black walnut, box-elder, cottonwood, elm, hickory, and oak. In 1856 about 5 per cent. of the land was in timber, and the early settlers cut out the best for log huts, fence posts, and fuel. The second growth covers most of that thus cut over. The growing forests will more than supply the place of those which have been removed. Black-walnut, cottonwood, honey-locust, and soft-maple groves are numerous all over the county. The young growth of the forest pushes out into the prairie since fires are kept out, and the forest area is about 6 per cent. of the county at this time.

Nearly one-half of the farmers are more or less engaged in raising black walnut, catalpa, honey-locust, and soft maple. The county is now so thickly settled that fires are soon brought under control. More individuals ought to avail themselves of the benefit of the "timber act."

Reports from Clay County show that in the central part fully one-half of the native forests have been cleared off. About 2½ per cent. of the area was timber land. Ash, box-elder, cottonwood, elm, and walnut were the original kinds. The forests have been cleared off for lumber

and fuel. The growing timber is so young it is useful only for fuel. The estimated amount of area of wood growing naturally is 5 per cent. With four years' experience on the frontier, and with considerable observation, the reporter says he finds that trees will not grow without water.

A Dickinson County correspondent says all timber on Government, railroad, State, and speculators' lands was "jayhawked" by the first settlers on upland farms. Timber was only left where the owner resided. The kinds are box-elder, burr oak, ash, cottonwood, elm, hackberry, honey-locust, and walnut, and it is of good quality. The area of timber is about 3 per cent. and is confined mostly to river, creeks, and small stream bottoms. Where the ground has been entirely cleared of large timber the young growth is kept under by the browsing of cattle and sheep. The forests have been cleared principally for fuel, and some in a rough state for building. A large amount of successful planting of forest trees has been made for the purposes of protection to crops and stock and for beautifying the home. The best species are ash, box-elder, hackberry, honey-locust, and red and white elm, red cedar, red mulberry, and walnut.

From long experience in tree-planting on the plains, the writer concludes that sowing the seeds of deciduous trees on the spot where the trees are to grow is decidedly the best practice. Of the foreign species worthy of cultivation are hardy catalpa, wild cherry, ailanthus, deciduous cypress, Russian mulberry, white mulberry, Osage orange, Austrian pine, mountain pine, and Scotch pine. Artificial tree growth could be increased by the dissemination of seed.

An Ellsworth County reporter says that in 1875 nearly 8 per cent. of the area of the county was in timber of poor quality. Perhaps 80 per cent. of the large growth has been cut down, mainly for fuel and fence posts. The young growth remains in good stand, consisting of ash, box-elder, cottonwood, elms, hackberry, red oak, mulberry, and walnut. Under the protection of the owners of timber, the young growth will fully replace the original amount of wood in the course of twenty years. Prairie fires, from time immemorial, by annually sweeping over the plains, have restricted the growth of timber to very limited belts along the banks of the streams, and even this territory has been invaded.

To preserve and increase the forests on the public domain, a corps of well-qualified foresters should be organized, who should be subjected to examination. Forestry stations should be created, put in charge of a chief forester, with prescribed power and duties to gain the desired end. Different species of trees should be cut to secure the most return, as follows: Ash and hickory, from 5 to 10 years old; basswood and cottonwood, from 20 to 30 years old; hemlock and maple, from 30 to 40 years old; red elm and hackberry, from 30 to 50 years old; oak and pines, from 40 to 50 years old; beech and locust, from 40 to 60 years old; butternut and black walnut, from 60 to 100 years old.

In planting trees in Western Kansas, it is well to plant on the lowest land you have, bottom, ravine, on a sag or on bottom land, the best slope being the north, east, or northeast. New broken land is the best. It should be stirred and harrowed thoroughly in the fall and seeds and nuts planted, freshly picked, in check rows 4 feet each way, or in rows 8 feet apart, 2 feet apart in the rows, making the longest way north to south. When growing, keep the young timber, by culture or mulching, clean of everything else. Permit poultry to range through it. Let every man use all means to protect his own forest, and let "Uncle Sam" assist in every possible way.

A Cloud County reporter says that not more than 1 per cent. has been cut for agricultural purposes, and timber is more abundant than when the county was first settled, when 3 per cent. of the county was original forest, composed of ash, maple, elm, hackberry, oak, and cottonwood. The timber has been used mostly for fuel, a little for fencing, sheds, &c. Forests are growing in excess of the removal. It is thought there is twice as much young wood growing naturally as when the county was first settled. Box-elder, cottonwood, and walnut do best on second bottom. The possibilities and advantages of planting forest are *great*, and every farmer has more or less of woodland. In late years breaking has been done to prevent the spread of prairie fires. A commissioner of forestry should be appointed to look after one of the greatest interests of the Government.

The report comes from Ellis County that, for the western half of the State of Kansas, one-half of 1 per cent. would be an overestimate of the area of natural growth of timber, a little more in some counties, in others very much less. Some of this little has been destroyed of late years by prairie fires and depredations of stock; also by the woodman's ax. Timber has been cut only for fire-wood, posts and poles for home use. The natural increase is quite rapid where fires and stock are kept out, but not equal to the destruction which arises from necessity, which knows no law. There is probably more than one-quarter of 1 per cent. of the area in Northwestern Kansas, where young wood is growing naturally; in Southwestern Kansas there is less.

The masses do not understand the possibilities and advantages of planting forest trees, for with care they can be successfully grown. Among the best timbers are ailanthus, gum, ash, wild cherry, the elms, hackberry, black locust, honey-locust, Osage orange, and black walnut, Perhaps 10 per cent. of the woodlands have been injured by prairie fires, caused by carelessness of parties and railroad men letting out fire. Much can be done by plowing guards both before and at time of fire.

The Government should establish Experimental Stations, with competent persons to give instruction in the art of growing trees. Aid of this sort need not be long continued. After a few years' work in the right direction the matter would take care of itself. Much depends upon the first impulse in this work.

A Franklin County reporter says about one-sixth of the native forests have been cleared. Of the standing timber there is a little burr oak, black walnut, hickory, cottonwood, and sycamore. About one tenth of the area of the county was formerly covered with wood. The forests have been cleared principally for fuel and lumber, and to a small extent merely to obtain land for agricultural purposes. The growing forests are greater in extent than the original. It is possible and advantageous to plant forest trees in this section, though the business is not engaged in. The kinds best adapted are *Catalpa speciosa*, black walnut, hackberry, hickory, honey-locust, oak, Osage orange, red and white elm. The seeds and cuttings should be thickly planted, in rows four feet apart, and cultivated well for three years.

A reporter from Lakin says:

My range of observation is through Reno, Rice, Barton, Pratt, Stafford, Pawnee, Edwards, Ford, Finney, and Hamilton Counties. The natural forest is confined entirely to the small streams and very limited. The varieties are green ash, red cedar, box-elder, elm, cherry, cottonwood, hackberry, black walnut, and willows. The growing forests will equal and far exceed any or all that have been removed. Considerable attention is now given to the planting and growing of forest trees. The young wood growing naturally will not exceed 1 per cent. Owing to lack of knowledge, want of proper planting and care, many are failing in their work. Timber is making rapid

growth, and doing well when cared for. The kinds best adapted as forest trees to this section are: Catalpa speciosa, cottonwood, elms, hackberry, black locust, and black walnut. Spring planting is preferred; seed should be planted in nursery rows and the transplanting done one year thereafter. Every precaution is being used to prevent fire, both by the railroad men and the people. It is advised that every one should guard against fire by plowing fire-guards around the timber localities. It would be good policy for the Government to see that her laws are strictly obeyed in the preservation of all natural forest. It would be well to establish experimental stations at different points, making schools of forestry. The conifers would probably grow seventy-five years before they would deteriorate.

A Douglas County reporter says:

All of the large saw-log timber left standing is of the second growth. It is mainly on streams or side hills, and about one-twentieth of the area, as near as can be estimated, is of good quality ash, cottonwood, elm, oak, and walnut. The forests have been cleared for lumber, shingles, cord wood, and fence posts. It is hard to get native lumber now. There is quite a lack of planting forest trees among the farmers. Farmers have been induced to plant walnuts. Land set out for timber and kept cultivated until it will take all of the ground, should be exempt from taxation for ten years after cutting.

The reporters from Leavenworth County state that nine-tenths of the native forests have been cleared off. The timber generally remaining is oak, hickory, and walnut. The principal part of the timber cut in this county was for fence posts and fuel, and it is thought that the present forests will supply one-half of those removed. About 5 per cent. of the area of the county is covered with a young growth of natural timber.

People do not plant seeds or cuttings very much, but almost any kind of forest tree succeeds here. The best method of growing trees is in rows about 6 feet apart, preparing the ground the same as for corn, and dropping the seed in the row. The young trees should be thinned out as they crowd in the rows. The cause of most fires is carelessness and "cussedness." It might be well for the Government to give occupants a part of the public domain if they would carefully grow and keep out fires from the forests on the land. It is thought that a forest in this county 40 years old would be worth from $100 to $200 per acre, according to the timber.

A reporter from Montgomery County says:

Not one acre in 1,000 has been cleared of the native forests in this and in Elk and Chautauqua Counties. The principal varieties of growing timber are black jack, burr oak, post oak, cottonwood, elm, hackberry, hickory, maple, persimmon, and walnut.

The supply of timber is gaining every year. The forests have been cleared chiefly for fuel, fence posts, lumber and rails. The percentage of growing timber in Elk and Montgomery Counties is about 10 per cent.; in Chautauqua, 15 per cent. The writer, in 1872, planted a small grove for a wind-break, and he now has a dense forest of box-elder, cottonwood, white elm, and maple, some ten inches in diameter. The woodlands have been injured at least 20 per cent. by fire. It is often attempted to burn a small patch, but it breaks away. Firing is sometimes malicious and sometimes comes from camp fires. The most sensible thing for the Government to do is to offer a premium sufficiently large to call the attention of farmers for the increase of forests.

A reporter from Osage County says:

Our streams when first settled were nearly all skirted with timber. The large trees were mainly sawn into lumber for building purposes. The kinds left standing are black walnut, cottonwood, elm, hackberry, hickory, the several kinds of oak, mulberry. The growing forest will soon supply the removed timber. The owners of land for the most part are putting out some forest trees. The varieties are box-elder, cottonwood, soft maple, black walnut, white willow, and evergreens. Prairie fires are fast becoming a thing of the past, and young timber is springing up and reaching far out into the prairie. The Government, to induce the preservation and increase of forests on the public domain, should exempt it from all taxation and execution so long as the holder keeps it in a healthy and growing condition. The people should

have kept before them the varieties adapted to our latitude, their quality, usefulness, good growing, &c.

A reporter from Fort Larned says:

The timber is young ash and box-elder, which grows along the creeks. The trees are small and fit only for firewood. Forest trees planted on timber claims under the United States laws will much more than replace the timber cut for fuel along creeks. In Pawnee County a large number of timber-culture entries have been made with varying results. Those that have been well cared for bid fair to be a success. Cottonwood does well on low lands; black walnut on either creek bottoms or uplands. The cause of prairie fires is carelessness. To preserve and increase forests on the public domain enforce the timber-culture law and require each homesteader to plant and cultivate three or more acres of trees and take care of them before he can perfect his homestead entry.

A reporter from Rice County says:

About a thousandth part of the county was originally a forest. About three-fourths of this has been cut chiefly for firewood. The standing timber is mostly elm, and nearly every farmer has planted a few cottonwood trees about his buildings. Some have planted single rows along the roadside. Only a few have planted bodies of timber. It would be well to exempt timber plantations from taxes and offer a premium for the best cultivated groves or pay a certain annual amount per acre for such lands, to be deducted from taxes.

A Sumner County reporter says:

One-half of the native forest was used in settling up the county. Box-elder, cottonwood, elm, walnut, and ash are doing well. The present acreage of cultivated forest far exceeds the native growth, but is not as large in size. All the settlers are planting forest trees. Of late there has been no firing of woodlands. The fires formerly originated through hunters. It were well to reduce taxes upon some ratio of cultivated acres of good timber.

A reporter from Thomas County says:

The county has no timber, though at one time it had a few trees. There are about forty persons trying to fulfill the law under the timber act. Hackberry stands the drought the best. It is better to plant seed than to set trees. It would be well to ascertain what kinds would grow best in different places, help the people to get them, and offer a premium for the best groves in a township at a certain time of the year.

A reporter from Washington County says:

Very little clearing-off of trees has been done here, except to cut down the gnarled old trees to make room for a better growth that the fires have never injured. The timber growth has increased one-eighth in this county by artificial planting and protection from fires. The wood has been cut for fuel; growing trees have more than supplied the place of that cut and timber increases. Young wood growing naturally covers one-eighth of the area of the county. A gain is made in increased rainfall and in the increase of the products inside of timber belts by the protection they afford. The settlers on the prairies are amateurs in forestry. Seeds should be planted as soon as they drop from the tree, and in Autumn. There should be clean cultivation of artificial groves and a wide strip plowed outside, and that again plowed late in the fall as a fire-guard. It would be well to let the planting of trees, at least five acres, be one of the conditions of proving up the pre-emption on homestead. Regarding the deterioration of trees, cottonwood is but a temporary tree, and ash, oak, and walnut should be planted with it at the same time to take its place.

A Woodson County reporter says:

Fifty per cent. of the original forest of the most valuable varieties has been cleared for fields, and all has been culled. Not more than 5 per cent. of the area of the county was formerly covered. About one-half of the forest cleared will be supplied with growing timber. The clearing primarily was for fuel, lumber, and other purposes.

From Wyandotte County the report is:

Only the rocky lands in Shawnee Township, such as it is difficult to cultivate, are yet in forests, and then only small or second growth is found. Very little is suitable for saw-mills. Most of the timber has been used for fuel in Kansas City, where it has always commanded a high price. It has also been used for railroad-ties. The destruction of timber in many cases has been wanton in the extreme. The young wood growing is mostly hickory, oak, and black walnut, of from sixteen to twenty-

five years' growth. Being so accessible to Kansas City, the forest of Wyandotte County cannot be maintained, unless it be in certain localities, where parks are or may be desirable. No forest fires have taken place during the last ten years. It would be well to offer suitable rewards to all planting and maintaining 40 acres of forest. A pension to such persons for twenty-five years might be a good thing.

A Lawrence reporter thinks that most of the native forests have been cut off for fuel, fencing, railroad ties, and building purposes. Along the water-courses, where bottoms were of sufficient breadth for farming purposes, about one-sixth of the area was originally occupied by native forests.

There are many tracts of young forests in Douglas County, mainly on lands and bluffs skirting the water-courses and deep ravines, but they occupy a diminished area, and will hardly reach more than one-half of the original tracts. About one-twelfth of the area of the county is young wood growing naturally. Though no serious obstacles exist to a successful forest tree culture, but very few have devoted their attention to it.

Assessors' returns furnish the following statistics: Total, 81 acres planted to forests, of which black walnut furnishes 31; white maple, 28; cottonwood, 6; honey locust, 2; other sorts, 14. The foregoing kinds, together with ash, catalpa-speciosa, hackberry, mulberry, Osage orange, form a preferred list for culture in the county. Seeds of all nut-bearing classes should be sown in autumn, others in spring, and such as ripen during the spring months as soon as ripe. All classes require thorough cultivation during the growing season each year, until their growth of roots entirely occupies the spaces between the rows. The years of culture will be determined by the distance at which rows have been planted and the vigor of the trees used. Rows 8 feet apart and trees 4 feet in the rows are the most common methods for planting. The woodlands of this region have not been injured by forest fires.

The "timber-culture act" should be retained and strengthened, and its provisions rigidly enforced. It were well to punish severely all violations of good faith; and to preserve the native forest, appoint *honest*, vigilant Government detectors.

An Allen County reporter states that one-third of the native forests of that county have been cleared off. One-tenth of the county was originally covered with forests. The timber left standing is of rather inferior quality, and embraces burr oak, red elm, water elm, black walnut, hackberry, hickory, and sycamore. The forests have been cleared for fuel and lumber, but the growing forests will fully supply the place of those cut away. The young wood growing naturally covers one-half of the area of the county. Very little planting of forest trees has been done. There has been no injury from forest fires. The General Government should establish experimental forestry stations, and the timber-culture act should be continued. Black walnut and burr oak will deteriorate at one hundred years of age, sycamore at seventy-five years of age.

KENTUCKY.

A reporter from Peach Orchard, Lawrence County, states that in Eastern Kentucky nine-tenths of the area is yet in forest. The poplar originally comprised from one-third to one-half of the total growth. It has been pretty well culled on lands lying within several miles of streams large enough to float the logs in freshets or by splash dams, fully from one-half to one-third of the country. Of the remaining standing timber four-ninths are white oak, two-ninths chestnut oak, and

the rest is mainly ash. The quality of the oak is tough, wiry, and good, though rather under Ohio sizes. Open bottoms, not much of the whole and small in extent, have been cleared for farming. Only the oak, poplar, and walnut have been marketed; the rest has probably been burned. As fast as the railroads penetrate these "everlasting hills" the land will be cleared for lumber sales. For the Central United States there are immense tracts to be cut in the lands off of the streams. The growing timber after clearing does not amount to much, and probably never will. The land does not seem to take to the new upstarts. The charcoalers, following the lumberers, most thoroughly damp the ambition of the new generation, and what lies beyond it hath not entered the heart of man to conceive; perhaps squatters and sheep.

There should be heavy fines or punishments for culpable negligence producing fires. There should also be a law compelling railroads to adopt spark arresters, and one compelling the district to unite in fighting fires, with local officers to attend to the same and show how to do it.

LOUISIANA.

From reports received it appears that Lower Louisiana originally consisted of timbered land, two-thirds; low prairies and sea marshes, one-third. One-half of the forest has been destroyed, either for agricultural purposes, for its timber, or by fire. The kinds of timber are given for this section as follows: Blue and red ash, white bay, bitter water, cedar, cottonwood, cassine, catalpa, cypress, chestnut, scarlet and willow chestnut, box-elder, white elm, chinquapin, devil-wood, dogwood, black gum, hackberry, live oak, burtram, post, laurel, swamp post, water and water-spanish oak, poplar, silver poplar, papaw, pecan, pignut, planet, persimmon, pond and long-leaved pine, black, sweet, and water locust, red and sweet bay, magnolia, swamp maple, mulberry, wild peach, loblolly, sassafras, sweet gum, sea palm, tupelo, sour tupelo, wahoo, wax myrtle, and willow. The southern half of the State is upland, about one-sixth being cleared. The kinds of timber are principally hickory, black jack, post, red, and white oak, and pine. In the bottom are sweet gum, hickory, cottonwood, cypress, burr, swamp, and white oak.

On the drier land along the bayous and rivers, the clearings have been made for sugar and rice fields. In the swamps the cypress has been cut for lumber, fence pickets, cross-ties, clapboards, and shingles. Live oak is used for ship-building. On many sugar plantations the supply of fire-wood is exhausted, and the planters are obliged to use stone-coal. At the rate the wood is now destroyed, there will be no more forest in the parishes fifty years hence. In Northern Louisiana the clearings have been for agriculture, lumber, fuel, and cross-ties for the railroads. There is more or less of native wood growing on three-fifths of the land in Northern Louisiana, but there is no young wood set for the purposes of timber in the State.

The Government should encourage the growing of black walnut, oak, and pine on the uplands, and cypress, white oak, and hickory in the bottoms; and it should devise means for protecting young timber. There is no possibility of planting forest trees in the swamps, since those which grow naturally are yearly destroyed by fire.

It is no exaggeration to say that 15 per cent. of the timbered land in Southern Louisiana has been destroyed. No growth of young trees can start where once tall trees stood, as jungles and prairie grass take their place, which are burnt nearly every year. Millions of young cypress and

other trees are yearly destroyed by prairie fires set by hunters. Whole townships, which were thickly wooded thirty years ago, have been wantonly burned and have been ever since an impenetrable thicket of vines, briars, and prairie grass, which being regularly burnt down every year, any young tree which may have started among them is killed. It is extremely difficult to convict the hunters, lazy negroes, and fishermen who set the fires. The laws against setting fire to prairies here are practically a dead letter. A fire once started spreads with lightning quickness in the tops of the trees, hung with dry moss, and along the ground among the cane-brakes and palmetto groves, and, if the swamp happens to be dry, it will burn the peaty soil to the depth of 2 or 3 feet and leave a lagoon.

The Government should have agents in every county and parish where it has any domain. It should be their duty to see that such timber lands have the same protection as those owned by private persons, and citizens should think that no person has any right to cut timber on the public lands. Disastrous fires should be prevented by the enforcement of the law, and the young forest trees would then grow up without artificial planting.

For the last ten years the timber in Northern Louisiana is holding its own or improving, except on the public lands, where it is being wofully destroyed. The cypress and pine timber should be protected, the young growth as well as the old. Any cypress tree cut down before it has attained the size of 20 to 24 inches of trunk diameter is a loss for industrial purposes. To grow to that size probably takes from sixty to eighty years. Ash, oak, pecan, poplar, and other trees generally have quite an insignificant use in the industries, except for fire-wood.

A New Orleans correspondent says:

Louisiana contains about 26,000,000 acres of land, and 1,250,000 acres water surface; one-half of the land is prairie. Not more than 20 per cent. of its woodland has been cleared of timber, and it has been done mostly for agricultural purposes. Its varieties of timber are cypress, gum, hickory, oaks, ash, elm, and yellow pine. More timber must yet be removed by the farmer, for 25 per cent. left remaining is thought to be sufficient. There is plenty of room for the lumberman and saw-mill. More young timber is growing than necessary to supply the amount needed, and the per cent. of new growth will at the present rate of consumption preserve the present amount of timber.

No effort is made outside of Government statutes to preserve live-oak forests on the Gulf coast for ship-building purposes. The live-oak is not now desired for these purposes, iron and steel being preferred. No further forest planting on the prairies is necessary, except for wood for cabinet-makers' uses. There is no injury to timber from forest fires; on the contrary, an annual burning of the grasses in the forest would improve both the timber and the grazing lands for cattle. The older the tree, except the most porous class, the better for the lumberman. None of the pines nor oaks, not the usual species for the saw-mill, should be cut which would not square at least 10 inches.

MISSISSIPPI.

From reports received from Madison Station it is found that at least two-thirds of the district embracing the counties of Copiah, Hines, Madison, Rankin, and Yazoo, and those immediately adjacent thereto, have been cleared of their timber. Except a few small prairies, all were formerly well supplied with wood and timber.

A Meridian report, embracing the counties of Clarke, Jasper, Kemper, Lauderdale, and Newton, states that all this section was formerly covered with timber—the growth being mostly pine. As a general thing, within 5 to 8 miles of the railroad, all the timber running through these counties has been used for saw-mill and railroad purposes, and

outside of that limit the land has been cleared of trees as needed for agricultural purposes.

A reporter from Montgomery, Lincoln County, whose observation has been confined to the counties of Copiah, Pike, and Lincoln, says:

The land was originally all timbered with long-leaf yellow pine; but about one-half of the timber has been removed. That still standing is as good as that removed. The forests have generally been cleared for cultivation. The undisturbed forests with the young growth on lands thrown out since the war will give ample supply for years to come. The young forest growth is equal to the wants for fire and fencing. In the Pearl River region, about Meridian, where the land is let alone after timber is cut off, a new growth comes up at once, and in five or ten years is ready for fuel. The rapidity with which it grows is wonderful. In the vicinity of Montgomery the young growth will not amount to much, except for fuel. One-third of the land formerly cultivated is now more or less wooded. Lands not cultivated will soon have young trees in fair supply, which grow rapidly. This is the report from Madison County.

From Meridian the report is, that when the pine timber is cut off in most cases a growth of oak comes up to take its place. But if the land be placed in cultivation and then thrown out, the pine comes up at once. The variety of oak is called "black-jack," or black oak.

From Montgomery the report as regards pine is, that probably not 5 per cent. of the young wood of the original forest is growing naturally.

From Madison the report is that, if the forest growth be let alone it will soon cover the old worn-out land of the county. The possibilities of growing valuable timber are almost unlimited, but there is no special attention paid to it. All varieties of the oak, except the live-oak, hickory, red, white, and tupelo gum, black walnut, ash, elm, locust, pine of different kinds, and other timber common to the West grow rapidly, and with culture would grow much faster than in higher latitudes. A Montgomery report is that pine springs up from seed, and would probably renew the forest but for the frequent fires. The oak springs up at the same time, but the fire does not kill the oak. There is no telling which would possess the land. Fires do a little damage in preventing young growth on uncultivated lands formerly in cultivation. These would be called old field fires.

A Montgomery report is that fire does not injure pine after it is five or six years old. But if the renewal of the fire is prevented, the pine and oak spring up as by magic, after the trees are cut. The woods are burnt to prevent the shade from smothering out the grass, but the grass is of but little value. The experiment is being made of keeping the fire out a few years. There is a probability that a plant called Lespideza would voluntarily grow and make much better forage than the grass.

The Madison reporter thinks the Government should keep a good agent to look after the timber. There should be strict laws with severe penalties for all depredators, and when the land is sold the person purchasing should contract to let from one-third to one-half of the land remain in forest. English and Northern capitalists are fast purchasing our magnificent pine forests. The avarice of capitalists, and the great number of saw-mill men, if not in some way checked, will ere long destroy the grand pine forests of this section.

MISSOURI.

A reporter from Albany says:

In Gentry, Harrison, and Worth Counties native forests have increased in area, and there has been an increase of timber in the oak varieties. This arises from the prevention of prairie fires since the settlement of the country, which has allowed the

rough lands to grow into well-timbered forests. The new timber is smaller than the original timber of the country, but it is of better quality. Probably one-tenth of the original area was in timber.

A Bethany reporter says:

Harrison County was formerly about one-fourth timber, three-fourths prairie, and it is nearly the same yet. There has been some timber land cleared for farming purposes, and for lumber. The principal kinds of timber are oak, hickory, cottonwood, elm, walnut, and sugar-tree.

A reporter from Harlem says:

During my residence of sixty years in Clay County, about two-thirds of all the forests have been cleared off. What is left is of poor quality. About one-seventh of the county was formerly covered with timber, and 90 per cent. of all valuable timber has been taken off for building, fencing, and for railroad purposes.

A Kansas City reporter says:

This whole township, Kaw, being on the Missouri River, was originally covered very thickly with timber. But the timber has been mostly cut off, especially within the limits of Kansas City, and in the Missouri River bottom. The timber still left is of the following kinds: oak, hickory, walnut, elm, ash, linden, sycamore, hackberry, coffee-beau, redbud, honey locust, wild cherry, hard and soft maple, and mulberry.

A Lebanon reporter says:

In Laclede and adjacent counties less than one-tenth of the timber has been cleared. Oak and hickory are the principal upland growths. The young growth of timber is making encroachment on the prairies.

A Westport reporter says:

About one-third of the woodland has been cleared off in Wyandotte and Johnson Counties, Kansas, and in Clay and Jackson Counties, Missouri. In Gentry County, the clearing has been for all the purposes named. In view of the improved railroad facilities for importing pine and coal, and the new systems of fencing, the present forests will supply the place of those which have been removed.

A Harrison County reporter says:

The growth has been nearly equal to the consumption for the past twenty-five years, as there have been no fires to injure the growing timber. The original forest was nearly all oak, good for fencing, fuel, and lumber. The forests have been cleared but little for farming.

A Harlem reporter says:

The growing forest will be sufficient to supply Clay County in fuel, fencing, and building material. All the land cleared of forests has been utilized for agricultural purposes.

A Lebanon reporter says:

Growing forests fully keep up the supply in Laclede and adjacent counties.

A Kansas City reporter says:

If the young trees were let alone they would soon supply the place of the original forest, except when the land is being cultivated. Most of the forest trees in Kaw Township, Jackson County, are doomed to disappear sooner or later.

A Westport reporter says:

Most of the forests hereabouts have been cleared for farming purposes and fuel, and but little for lumber. The forests will not half supply those cut off.

A Harrison County correspondent says:

About one-fourth of the area of the county was covered with timber. Young timber continues to grow on the same territory, but does not extend into the original prairie land.

A Harlem reporter says:

About one-third of the area of the original forest remains growing.

A Kansas City reporter says:

About 40 per cent. of Kaw Township, in Jackson County, is now covered with growing forests.

A Laclede County correspondent says:

Young timber is growing up as a general rule quite thickly over most of the uncultivated lands, which amount to more than three-fourths of the area within a radius of 50 miles from Lebanon.

A Westport reporter says:

One-fourth of the woodland in that section is probably young growth timber.

A Gentry County reporter says:

No one here is engaged in raising forest trees, but it could be done to great advantage. Catalpas are a success, also walnuts, and it is presumed most of the forest trees of this region are equally so.

A Harlem reporter says:

There is no necessity for planting forest trees in Clay County, and no one engages in it.

A Kansas City reporter says:

There is no planting done in Kaw Township, Jackson County, except for purposes of ornament and shade in yards, lawns, and parks. None is planted for timber-raising purposes.

A Lebanon reporter says:

There is no planting of forest trees except evergreens and deciduous trees for shade and for ornamental purposes.

A Westport reporter says:

Forest trees could be grown well, but the land is too high. There are larch and pines from ten to twelve years growth 25 feet high. White ash, elm, white and Scotch pine and larch do well.

A Gentry County reporter says:

There have been no forest fires to any extent in this section since the settlement of the country.

A Harrison County reporter says:

There have been but few forest fires here for 25 years.

A Kansas City reporter says:

There have been no forest fires in Kaw Township, Jackson County, since the settlement by the whites.

A Laclede County reporter says:

The timber here has been dwarfed and retarded in growth by grass fires, but the timber itself does not burn.

A Westport reporter says:

There have been scarcely any forest fires.

A Harlem reporter says:

Since the Government is not able to preserve existing forests, it would be the height of folly to attempt to increase forests on the public lands.

A Kansas City reporter says:

Congress should enact laws to induce owners of woodlands to preserve the native growth. Laws should be passed to encourage the planting of forest trees in those parts of the country destitute of them, and to more rigidly protect and preserve the timber on the Government lands.

A Kansas City reporter says:

On an average, a hickory tree comes to its prime at about 25 years of age; linden, at about 30; ash, at about 35; oak, at about 50; and walnut, at about 75.

NEW MEXICO.

A report from Fort Wingate says:

The fine forests in Valencia County have not been reduced to any extent. Pine timber of fair quality is abundant. Timber is cut for building military posts, rail-

road bridges, lumber, and ties. Pine wood is used for fuel, and there is plenty of young pine growing. There is no land cleared for agricultural purposes. The timber tract extending through here, running east and west, is large—10 miles by 70. The amount of growing young timber is difficult to state. There is no encouragement for planting, except where the trees can be irrigated. Tree-planting is unknown here. Forest fires are generally caused by carelessness of parties camping in timber. There is no means of preventing this by law punishing the offenders. Stumpage should be invariably collected from parties cutting timber on public lands, and laws should be passed to punish men who fire any timber tract. There are good sound trees in this country 2 feet in diameter, but dry-rot most frequently attacks the largest.

SOUTH CAROLINA.

A reporter from Cokesburg says:

In the middle counties of South Carolina the forests were greatly destroyed before the war to enlarge the cotton area. We cleared more land to make more cotton and to buy more negroes, and thus ran the wheel. The upper counties are thickly covered with oak and hickory; the lower with pine forests. The denuded arable lands, when worn too much for profitable cultivation, if left to rest, will, in a decade, reclothe themselves in a beautiful pine growth that recuperates the soil very rapidly. Our pine thickets of second-growth forests are famous. All the oak, hickory, and pine forests of this State are of natural growth, and they cover, perhaps, two-thirds of the area of the State. There are no artificial forests; we plant simply fruit and shade trees about our homes. For shade trees the ash, elm, maple, sycamore, and two or three kinds of oak are transplanted, but there is no transplanting resorted to to increase the forest area. Woodlands are scarcely injured by forest fires. The General Government, to preserve and increase the forests on the public domain, should sell the land to actual settlers, and to them alone. In regard to the deterioration of trees, timber here is so abundant that only the soundest, and that having the best heart, is used, regardless of age.

TENNESSEE.

A correspondent from Medina, Gibson County, says:

About 75 per cent. of the area of this county has been cleared off. Originally it was entirely covered with wood, and the standing timber is of good quality, mostly gum, hickory, oak, and poplar. The forests have been cleared principally for agricultural purposes. Much has been cleared for lumber, and considerable for wood, ties, and timber for railroads. Growing forests will only supply the place of those removed to a very small extent. There is about 2 per cent. of young wood, mostly oak, growing naturally. Probably 5 per cent. of the cleared lands are too much worn for profitable cultivation, which could be planted to forests; such trees as walnut, wild cherry, and mulberry would make the land valuable. The advantage of planting forest trees is very great. The settlers might be induced to increase their timber lands by appropriation, but not to any very great extent, as there is still an abundance of timber, which increases in value as it gets older, and does not deteriorate at any certain age.

TEXAS.

A reporter from El Paso says: "There are no forests in this part of Texas worth speaking of; only a few cottonwoods along the Rio Grande. The advantage of planting forest trees here would be an assistance to agriculture. None are engaged in it. The cottonwood seems to be the best adapted to this section, and other trees might do well. The lands in forests in Texas belong to the State. The only way to increase the forests would be to plant and then protect them until they are large enough to receive no injury by stock. As the cottonwood is of but little value it might be cut at any time.

REPORT UPON THE LUMBER AND WOOD TRADE IN CERTAIN STATES.

By F. P. BAKER, *Agent of the Department.*

Circular "B," of which a copy is appended, was sent out to the States and Territories hereinafter named, the number transmitted and reports received being as follows:

States and Territories.	Circulars sent out.	Circulars received.
Alabama	552	96
Arizona	8	2
Arkansas	394	80
Colorado	132	28
Florida	276	45
Georgia	776	113
Indian Territory		1
Kansas	108	32
Kentucky	476	71
Louisiana	207	25
Mississippi	384	55
Missouri	557	77
New Mexico	32	1
North Carolina	857	97
South Carolina	430	45
Tennessee	720	83
Texas	604	96
Total	6,513	946

CIRCULAR "B."

DEPARTMENT OF AGRICULTURE.

FORESTRY DIVISION.

To ——— ———:

The Department of Agriculture having been directed by Congress to make certain investigations in reference to forestry, the undersigned has been instructed by the Hon. George B. Loring, Commissioner of Agriculture, to prosecute inquiries upon certain points relating to the subject.

Among the points upon which full information is desired is the extent of the lumber and wood trade. To obtain such information this circular is sent to you, with the request that it be filled up with your replies to its questions and returned to the undersigned at ——— at your earliest convenience.

It is proper to say that the information obtained by these inquiries will not be published in connection with the names of those making the returns, but only in aggregates of counties and States. It is obviously for the interest of all engaged in the lumber and wood trade that the published statements should be as accurate as possible, but where precise records of business are not kept the summaries may be made from the best estimates attainable.

Very respectfully, yours,

———,
Agent of the Department of Agriculture.

———, *July*, 1883.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material.

[NOTE.—As the principal object of this inquiry is to ascertain the amount of lumber

and other wood products prepared for market, no establishment should be included unless it employs logs, blocks, or timber from the *forest*. Mills for re-sawing, planing, or other forms of wood-working, in which sawn or otherwise prepared lumber or wood is used as first material, *should not be included.*]

2. What amount of logs or timber (estimated in board measure) was used in your factory during the year 1882?

3. What is the estimated amount for the year 1883?

4. What is the average number of logs required for making 1,000 feet of boards?

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

	1882.	1883.
Boards and other sawn lumber	M.	M.
Laths	M.	M.
Shingles	M.	M.
Staves	M.	M.
[Mention other principal products.]		

6. What suggestions can you offer, as the result of your observation or inquiries, in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

9. Miscellaneous remarks. [Under this head mention any injuries to woodlands under your notice which are taking place, whether from insects or other causes, and notice any other facts that may be deemed of interest in connection with the subject of forestry generally.]

Name of person reporting: ——— ———.

Post-office address: ——— ———.

Date: ——— —, 1883.

ALABAMA.

Circular B was sent to 552 places, and returns have been received from 95.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material?

The following are reported: 92 saw-mills, 6 shingle-mills, 4 matching and planing mills, 2 stave-machines, 2 sash and blind machines, and 2 rosin and turpentine stills.

4. What is the average number of logs required for making 1,000 feet of boards?

The aggregate reports are as follows: 25 mills report 5; 12 report 4; 10 report 6; 8 report 3; 5 report 10; 4 report 8, and 4 report 2. The other mills vary from $3\frac{1}{2}$ to 11 logs. A few mills make no report.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

Products.		1882.	1883.
Boards and other sawn lumber	M.	141,074	157,337
Laths	do.	2,238	8,922
Shingles	do.	5,400	14,100
Staves	do.	3,796	4,060
Other principal products:			
Barrel-heads	do.	360	420
Pickets	do.	50	50
Hewn pine timber	do.	1,962	1,900
Total	do.	153,880	186,789

6. What suggestions can you offer as the result of your observation or inquiries, in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

ORIGIN AND EXTENT OF FOREST FIRES.—Fires in the forest are caused by sparks from the railroad engines, by campers leaving burning fires, by smokers dropping burning matches, by opossum and raccoon hunters snuffing torches and dropping coals of fire, by farmers and cattle-men firing the woods so as to have feed for stock, and by negroes sometimes burning the woods so that rain may fall.

Quite a difference of opinion obtains as to the damaging effects of forest fires, the prevalent opinion being that fires in the timber lands of the South are not as destructive as in the forests of the North and West.

The preponderance of sentiment is, that in burning the forests annually on or before the middle of March, at a time when the weather is damp, though many sprouts and seedlings may be thus destroyed, the good, matured timber is practically unharmed.

Prevention.—Squatters and claim-makers should be prevented, in the opinion of several correspondents, from "deadening" the forest trees. The State law permitting firing under specified conditions of the forest from the 10th of March of each year to the 1st of September should be strictly complied with, and perhaps be modified in the matter of permitting burnings to be made through all the summer months. The turpentine ax should grow into disfavor, and the "turpentine orchards" should be diminished rather than increased, the owners of the same being placed under more careful and exacting restrictions than those now obtaining.

Some correspondents think the General Government should take the matter in hand and provide a penalty for firing timber, excepting such as may be lawful, by imposition of heavy fines and certain amount of imprisonment.

A Shelby County correspondent avers that it takes about two hundred years to produce first-class yellow-leaf pine—Alabama's prevalent timber.

Control.—To control a forest fire, it has been suggested to cut a belt of timber around it; and a Bullock County correspondent proposes to have road overseers empowered to call out hands and subdue raging fires. A Pike County correspondent thinks fires once in two years would clean out leaves, general underbrush, decayed trees, limbs, and logs, so as to prevent the burning of large timber.

Maintenance of woodlands.—It is established that pine trees cut in spring sour, worms get into them, and thereby large quantities of sound standing timber are prepared for speedy decay; therefore the mandate should go forth at certain seasons of the year, "Woodman, spare that tree."

A DeKalb County correspondent wisely suggets that woodlands should be kept up by planting as much timber as is cut.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

No limit, 26 reports; 12 inches, 14 reports; 10 inches, 14 reports; 15 inches, 10 reports; 16 inches, 7 reports; 18 inches, 6 reports; 14 inches, 6 reports; 24 inches, 2 reports; 17 inches, 2 reports; 8 inches, 2 reports; 30 inches, 1 report; 20 inches, 1 report.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

Yellow pine, 79 reports; oak, 37 reports; poplar, 31 reports; pitch pine, 19 reports; hickory, 17 reports; gum, 11 reports; ash, 10 reports; cypress, 6 reports; walnut, 5 reports; chestnut, 4 reports; cedar, 3 reports; white pine, 1 report; juniper, 1 report; magnolia, 1 report; maple, 1 report; birch, 1 report; short-strand pine, 1 report. Yellow pine largely predominates.

9. MISCELLANEOUS REMARKS.

The reports from this State show a general apprehension that the native forests will rapidly disappear, unless public attention be more earnestly and speedily directed to the necessity of effective measures to prevent the wholesale destruction of so many of the majestic forests of this great lumber region.

A correspondent from Covington County mentions the ravages of the pine bug, which are very great in fallen timber and in "girdled" trees, and these are extended into the thrifty growing timber. He suggests as a means of preserving the forests that the General Government should not permit the forest region to be homesteaded or taken by the capitalists, who so remorselessly slay the forests for the purposes of immediate gain, without any reference to the prospective benefits of timber land to the country. A great loss is reported from Butler County by cyclones, storms, and the pine-worm, the ravages of which have been very great.

From Citronelle, Mobile County, the report is that the Colorado beetle or boll-worm, which is left behind in the destructive race of the turpentine ax, causes immense destruction to the trees of the conifer species, and also others that may be in contiguity to them, notably damaging to the chestnut.

From De Kalb County the complaint comes that the worm is very destructive to the chestnut. It appears in fallen timber in autumn, caused by tree-cutting in the summer, the worm extending to the living tree and killing it. It also follows in the wake of the tan-bark peeler.

From Elmore Station the report comes that insects getting into the pines in August will destroy two or three acres of timber in a given place.

An Etowah County correspondent says that young ants destroy thousands of trees after felling them in the spring or in early summer, the main timber being yellow pine. From Hurricane Bayou the report comes that the almost sole injury arises from "boxing" the pitch pines for turpentine, which are abandoned after four years, and a desolate waste ensues in about five years.

A Lumberton correspondent says: "In low lands, after a long drought, when rain comes, trees die by thousands, and in falling, if a tree strikes another, it dies right away by infection, the disease being denominated 'dry scald.'"

From Monroe County the report is that the low price of land develops the turpentine business, and trees give the individual owner the chance to ruin the timber on his own land.

A Newtonville reporter states that there is considerable death to timber from many insects.

From Perdido Station the "turpentine plague" is mentioned, and the consequent death of timber from worms.

A Russellville correspondent states that if the pine timber is cut during the summer months it is subject to the ravages of the grayish beetle. It cuts a funnel-shaped cavity through the rough bark and deposits its

egg in the inner bark; the egg hatches in a few days and the worm goes to work cutting all through the log. Thus the growing pines in the vicinity are attacked and killed.

A correspondent from Scottsborough says the Colorado beetle lives in the heart of the old timber in that locality.

Tallapoosa County reports that in June, July, and August large bodies of good timber are destroyed on each side of the Tallapoosa River, there being a belt of timber ranging from 40 to 60 feet of trunk having freedom from knots.

A Whitney correspondent says that when trees are cut in the months of May, June, July, and September, the worm gets into the standing timber.

From Allen's Factory comes the report that the fire set out for the purpose of burning leaves, worms, and underbrush, destroys great quantities of young pines and chestnuts.

From Bozeman, a yellow-pine region, the report says that young pines are benefited by the woods being burnt in the wet part of the spring.

A Clay County correspondent states that dense undergrowth, when fires are kept out, produce pine, white oak, hickory, maple, poplar, and sweet gum. Large oaks die from too much shading of the many roots.

Another correspondent reports that colored homestead settlers destroy millions of dollars annually of yellow pine by "girdling," "coon hunting," &c. Dry-rot at the butt and a decayed condition of the timber is a considerable complaint.

From Forest Home is a report that large amounts of forest trees are deadened annually and allowed to waste.

A Queensborough correspondent says that oaks are killed by drought, and chestnuts and young timber affected by worms.

From Hall's Switch comes the report that chestnut is injured greatly by some unknown insect.

From Lauderdale County the report is that two-thirds of the chestnut timber has been destroyed by fire.

A correspondent from McIntosh Bluff states that there should be more stringent laws to punish for firing timber, and no fires should be set out before the 15th of March.

A Randolph correspondent reports that shingle men chip a great many trees to see whether or not they are straight grained, and thus great damage is done.

From Stevenson comes the report that ash trees are dying from no known causes.

A correspondent from Whitney insists that Government protection is necessary to save the trees so recklessly and causelessly destroyed.

Another correspondent says there has been an immense destruction of the Georgia pines by cyclones.

From Bullock County are reports that raccoon and opossum hunters cause very great destruction of the forests.

A Canton correspondent says the long-leaf yellow pine has been immensely injured by fire in that vicinity.

A correspondent from Georgianna reports that the time required to grow trees for good lumber is from twenty-five to forty years. Here many trees are destroyed by fire in their infancy, and secondarily by ants as an outcome from the fires.

From Headland comes the report that a great deal of fine pine lumber is destroyed by farmers bringing the land into cultivation, and from Hayes County that great injury is done by worms.

A Mobile correspondent descants upon the bleeding of the pine by the turpentine men as an incalculable injury.

From Wilsonville the complaint is that iron manufacturers who run charcoal blast-furnaces cut everything in yellow pine two inches in diameter.

Baldwin County reports that pines "boxed" for turpentine last from three to four years; fires then easily destroy them, and also other valuable trees.

From Columbia the report is that the cyclones and the equinoctial storms do very great damage to the large stock of pitch and yellow pine.

A report from Talladega County states that the chestnut tree is dying out from a boring worm, which appears in the falling trees in autumn, caused by the summer cutting of timber. The worm extends its work to the lining of the tree and kills it.

From Houston, Winston County, the report is that 10 per cent. of the pine destroyed by insects is caused by an April storm which blew down great quantities of forest timber.

ARIZONA.

Circular B was sent to eight places; returns have been received from two.

1. Nature of the business reported, whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material.

There is a report of two saw-mills, one of which has a shingle and lath mill attached.

4. What is the average number of logs required for making 1,000 feet of boards?

Three and one-half and a fraction over five.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The aggregate is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	2,152	20,300
Laths	do..		300
Shingles	do..		5,000
Staves	do..		
Total	do..	2,152	25,600

Other principal products, none.

6. What suggestions can you offer, as the result of your observation or inquiries, in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

Care on the part of the prospectors and campers would prevent very much destruction of timber.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

One report is 15 inches, the other 16 inches.

8. What kinds of timber are chiefly used in your business, and the relative amount of each.

Pine principally, and a very small growth of fir.

9. MISCELLANEOUS REMARKS.

In June, 1879, fire ran over the mountains at Big-Bug, Yavapai County,

and destroyed some timber. Since then there has been no fire. Considerable of the timber is defective. It is probably caused by want of moisture a portion of the year.

ARKANSAS.

Circular B has been sent to 394 places; reports have been received from 80.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material?

The report embraces 68 saw-mills, 8 shingle-mills, 1 stave-machine, and 1 sash and blind machine.

4. What is the average number of logs required for making 1,000 feet of boards?

The report shows 19 mills requiring 3 logs, 8 mills requiring 4 logs, 7 mills requiring 5 logs, 6 mills requiring 6 logs, 5 mills requiring 2 logs, 3 mills requiring $4\frac{1}{2}$ logs, 2 mills requiring $2\frac{1}{2}$ logs, 2 mills requiring 10 logs, 1 mill requiring 8 logs, 1 mill requiring 7 logs, and 1 mill requiring $5\frac{1}{2}$ logs.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The aggregate is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M.	57,944	75,137
Laths	do.	3,460	5,335
Shingles	do.	1,883	2,666
Staves	do.	200	200
Other principal products:			
Barrel heads	do.	.....	200
Railroad ties	do.	7	2
Hickory spokes	do.	.....	15
Axle-trees	do.	.....	10
Total		63,494	83,565

6. What suggestions can you offer as to the result of your observation or inquiries in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

Origin and extent of forest fires.—Fires are promoted by hunters leaving fires at logs where they camp at night; from tramps and locomotives; from clearing and from teamsters, and sometimes from malicious motives.

Prevention and control.—It is suggested that laws should be enacted more stringent than the present ones. Clear up the right of way along railroad lines and the damage would be slight from fires.

Maintenance of woodlands.—In caring for property for the future, every spare foot of ground should be planted to serviceable timber. When the Indians fired the forests every year, they were comparatively healthy. It requires occasional fires to keep down the dense thickets, and thus promote the growth of valuable timber.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

The reports show: No limit, 16; 12 inches, 13; 14 inches, 7; 18 inches 7; 16 inches, 6; 10 inches, 4; 15 inches, 3; 8 inches, 2; 20 inches, 1.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

The reports show the following: 44, pine; 43, oak; 19, cypress; 16, gum; 13, walnut; 11, ash; 8, hickory; 5, poplar; 2, sycamore; 1, cherry; 1, cottonwood; 1, elm; 1, maple.

9. MISCELLANEOUS REMARKS.

A correspondent from Arkadelphia states that deadening for farm purposes is destroying more timber than all other causes.

From Butler County the report comes that timber makes two or more growths each year, and that it would be fit for market in 25 years from the seed.

A report from Clay County states that caterpillars do damage every spring for a period of from four to six weeks, and consequent upon their ravages hot weather completes the destruction of considerable timber.

A correspondent from Donaldson thinks the fitful claim-hunters destroy much valuable pine timber on Government lands; changing their minds they abandon their location, and thus the timber deadened by them becomes a prey to worms.

A Gifford correspondent thinks the squatter the worst enemy the timber interest has, regarding the homestead law as doing more to produce a timber waste than all other things combined.

A Hot Springs County correspondent reports great damage by the borer or wood worm, first commencing on felled timber, and then attacking the live trees.

A correspondent from Jefferson County reports the death of a few trees from the hot, dry weather.

A Monticello correspondent reports great damage from insects.

From Newport a correspondent speaks of cypress having a disease known as "pecky," the sawed logs of which have an appearance of large worm crevices.

From Powhatan it is reported that large white and red oaks are subject to insect ravages.

From Red Bluff comes the report that trees boxed for turpentine are ruined within ten years.

From Scott County the complaint is that pine timber is dying from bugs or worms getting into the standing timber.

A Yellville correspondent complains of the injury done to pines by worms and insects.

A Chidester correspondent reports that birds peck timber and let worms into the down and standing timber.

From Hickory Station the belting ax is condemned as very destructive to timber, destroying large belts of it.

A Johnson County correspondent states that the apple-borer, which cannot be seen by the naked eye, does a vast amount of damage.

A correspondent from Little Rock says the sawyer or flat-head worm works in the pine cut early in July and August, great damage being done to standing timber.

From Malvern Junction the reporter says that in August the sawyer, a white grub worm, works through the sap wood and kills the tree.

From Boone County it is charged that board-makers from agricultural districts invade Government lands and wantonly destroy the forests.

A Jonesboro' correspondent says caterpillars kill a large amount of oak in the spring.

COLORADO.

Circular B has been sent to 132 places, and reports received from 28.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first-stock material?

The report shows 24 saw-mills and 12 shingle-mills.

4. What is the average number of logs required for making 1,000 feet of boards?

The reports show that, of the number, 5 require 12, 5 require 10, 2 require 5, 2 require 8, 2 require 15, 2 require 18, 1 requires 2, 1 requires 6, 1 requires 7, 1 requires 9, 1 requires 20.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The reports aggregate as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M.	14,550	11,122
Laths	do.	2,410	1,200
Shingles	do.	4,430	5,575
Total		21,390	17,897

6. What suggestions can you offer as to the result of your observation or inquiries in regard to the region and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

Hunters' and prospectors' camp-fires are the cause of forest fires. In the fall of 1879 Indians fired the timber west of Hahn's Peak so as to be able to shoot deer and elk with the bow and arrow. The loss of timber from camp-fires and locomotives near Leadville is thought to be greater than the amount of sawed timber.

At Colorado Springs it is said that the Government timber agents do not perform their duty, so much of the Government timber is cut and destroyed. The State and General Government should require heavy penalties from the hunters and campers who start the fires. A Pueblo correspondent says more stringent laws are necessary for the prevention of fires.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

In the reports six indicate 12 inches; five, 8 inches; four, 6 inches; four, 10 inches; one each of 15 inches, 14 inches, 9 inches, 4 inches, and no limit.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

The reports indicate 18 of pine, 16 of spruce, 2 of balsam of fir, 1 of aspen.

9. MISCELLANEOUS REMARKS.

A correspondent from Denver states that parties getting mining timber will burn the forest for miles, in order to get dry trees for the coming year, thereby causing great destruction of very valuable timber.

A Georgetown correspondent says that fire passing over a body of timber leaves barrenness, and the fire-killed timber is preferred for fuel and mining timber.

From Huerfano County the report states that the drought or dry winds destroyed thousands of acres during the years of 1882–'83.

A correspondent from Pueblo says trees have been damaged by lightning, but were fires kept out there would never be a destitution of timber in the Rocky Mountains.

A Leadville correspondent thinks a stumpage law would be a benefit both to the people and to the Government. The neglectful camper and charcoal burner destroy the Colorado forests.

From Colorado Springs, reports say that fires are set out through carelessness, and that they annually destroy thousands of acres of good timber lands.

A correspondent from Gunnison blames the Indians and prospectors for the fires, and says twenty times as much is destroyed by them as used for all purposes.

From Hinsdale County there is an impression that, as the best timber is on the north side of the mountain, where it is generally wet with rain or snow, the timber may improve.

From Routt County the information is that the Indians have burned millions of acres of timber in Western Colorado.

A Hahn's Peak correspondent says the porcupine barks the trees from 8 to 10 inches in width.

FLORIDA.

Circular B was sent to 276 places; returns were received from 45.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material?

Saw-mills reported, 42; shingle-mills, 10.

4. What is the average number of logs required for making 1,000 feet of boards?

Of 5 logs to the thousand feet, there were 19 reports; of four, 13; of six, 8; of three, 7; of two, 3; of seven, 2; of eight, 2; of ten, 2; of three and a half, 1; of four and a half 1; of five and a half, 1; of eleven, 1.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The aggregated reports are as follows:

Products.		1882.	1883.
Boards, and other sawn lumber	M..	87,392	83,425
Laths	do..	2,220	1,970
Shingles	do..	3,350	2,700
Staves	do..	140	265
Other products:			
Pickets		50,000	50,000
Doors		.....	1,200
Windows		.....	1,800
Orange boxes		565,000	1,175,000
Total		708,102	1,316,360

6. What suggestions can you offer, as the result of your observation or inquiries in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

The origin of forest fires is from stockmen who control given sections of country and fire the timber for the promotion of the growth of young grass. Negroes burn the forests to see the fire, and they are burned so as to attract deer in early fall and have the young grass for

them. This is also called the calf-burn. The prevention of fires should be effected by the enforcement of the State law, and there should be more stringent State and national enactments. Woodlands could be kept in a thrifty and growing condition should there be annual fires in February or early March under proper restrictions, and there should be an abandonment of turpentine works.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

From fourteen reports it is "no limit;" from thirteen, 12 inches; from twelve, 10 inches; from four, 14 inches; from three, 8 inches; from three, 6 inches; from two, 13 inches; from two, 15 inches; from two, 16 inches; from one, 9 inches; from one, 17 inches; and from one, 20 inches.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

From 38 reports pine is reported; from 12, cypress; from 3, cedar; from 2, oak and hickory; ash, beech, and magnolia, each 1.

9. MISCELLANEOUS REMARKS.

A Branford correspondent reports large quantities of timber destroyed by the turpentine interest, and that the people are very wasteful in cutting.

An Escambia correspondent complains of extensive depredations being made on public lands, and that the Government is inefficient in protecting timber on the same.

From Fort Dade the report is that trees boxed for turpentine take fire readily and burn down to a great extent; they often die from wounds without burning.

A Georgiana correspondent, in referring to the peninsula of Florida, says it is a vegetable accumulation, and the soil is entirely ruined when burned. The cow men, the winter visitors, and others are constantly burning the forests.

A correspondent from Hamilton County says there is the best and finest timber of Florida in the Suwannee River country. Yellow pine, oak, and cypress are sawed in great abundance at the Ellaville Mills.

An Izagora correspondent speaks of great destruction of timber from the nocturnal gales. Burnings of the forest are lawful from the middle of February to the middle of March. There should be severe punishment to those who set fire at other periods.

A Jackson County correspondent thinks great damage is done to the timber by the clearing made by small farmers. The consumption of lumber there is about four times as much as it was two years ago.

A correspondent from Lake Jessup says logs attacked by the worms are practically ruined in six or eight weeks' time. They must be placed in the water to be saved.

A Bluff Slogo correspondent says Congress ought to pass a law prohibiting boxing for turpentine, allowing it only on one side of the tree, and requiring owners to protect the tree afterwards.

A correspondent from Hernando County says hard-wood timber is being destroyed for the purpose of making room for orange groves.

A Lawley correspondent thinks owners of timber land are careless because ninety-nine one-hundredths of the State is in forest.

A Pine Barren correspondent says that timber there does not grow

fast because of tapping the trees for turpentine, and the burning greatly impoverishes the soil.

A Quincy correspondent says there is a great deal of poplar in the low lands which is hard to get. Severe storms, about thirty-five years ago, destroyed nearly all the cargo timber.

From Santa Rosa County the report is that their timber is rather shaky. The principal depredations are from cutters who do not own the land, and they take it when they may.

From Tampas Mills comes the report that the hammocks are filled with valuable woods for cabinet use—red bay, magnolia, wild cherry, royal palm, palmetto, caoutchouc, and other woods. Black walnut, hickory, locust, white oak, and pecan, where introduced, have flourished.

A Walden correspondent says by judicious management forests could be replaced in a short time.

A Bristol correspondent says fires do not injure the timber until the trees are hacked or scarred so that the gum or turpentine runs out, furnishing material for forest fires.

The report from Orange County is that nearly all the large timber is rotten in the center and shaky.

From Suwannee Shoals the complaint is of the turpentine interest.

A Limona correspondent says the soil being so light and sandy the vegetable matter is burned with the timber in raging fires, thus leaving the ground nothing but a barren sand.

GEORGIA.

Seven hundred and seventy-six copies of Circular B were sent out; reports have been received from 113.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material?

There are reported 111 saw-mills and 21 shingle-mills.

4. What is the average number of logs required for making 1,000 feet of boards?

From the returns received, twenty-seven reports give 4; twenty-two, 5; fifteen, 3; ten, 6; nine, 7; eight, 10; four, 8; one, 2; two, 2½; one, 3½; one, 9.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The aggregated reports are as follows:

Products.		1882.	1883.
Boards and other sawed lumber	M..	250,325	220,296
Laths	do..	16,577	21,687
Shingles	do..	31,213	22,372
Staves	do..	1,751	6,647
Other principal products:			
Squared timber for rafting	do..	70	90
Cross-ties	do..	9,771	.....
Total		299,707	271,092
Cord wood	cords..	500	800
Charcoal	bushels..	217,320	.....

6. What suggestions can you offer as the result of your observation or inquiries, in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

The reports show that opossum and coon hunting, mainly by negroes,

is one great cause of the fires, also the turpentine business; and it is estimated that in Florida and Georgia one-fifth of the forest timber is thereby destroyed. The fires in the timber are usually stopped by the public roads or by rain, but the best way to check them is to set fire in front of the prevailing fires and then put them out. One reporter says but for the turpentine business there would be plenty of timber in the State for one hundred years. It is deemed a duty to set out and grow such timber as suits the climate and have more stringent laws against burning the forests. Turpentine making should be suspended; if it is not, the pine of the south will in a few years be nearly destroyed.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter; if so, mention the least diameter of girth that is allowable in cutting trees?

The report shows that there was no limit at 35 mills; at 22 mills it was 12 inches; at 20 mills, 10 inches; at 7 mills, 8 inches; at 4 mills, 6 inches; at 4 mills, 14 inches; at 3 mills, 9 inches; at 1 mill, 4 inches; at 1 mill, 13 inches; at 1 mill, 15 inches; at 1 mill, 16 inches; and at 1 mill, 18 inches.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

The reports show that the various pines are greatly in the lead, and a summary is as follows: Pine, 98; oak, 43; poplar, 35; hickory, 20; walnut, 14; gum, 9; ash, 7; beech, 3; cherry, 3; maple, 3; chestnut, 3; birch, 2; china, 1; cypress, 1; elm, 1; mulberry, 1, and sassafras, 1.

9. MISCELLANEOUS REMARKS.

The reports received from this State possess very much value.

An Albany correspondent states that millions of timber trees are destroyed annually because of cutting the boxes for turpentine work close together and deep into the heart of the pine. Tree-cutting late in the spring also does much damage.

A Bolton correspondent says there is a large amount of young pine timber destroyed by the careless cutting of pine stock in summer months; worms get into dead tree-tops and from thence into the young pine and destroy it.

From Chauncey comes the complaint that managers of naval stores tap everything from 6 inches in diameter up. The annual fires and winds destroy the small growth in consequence of its being tapped by the turpentine men.

A correspondent from Walton says the consumption of the forests along the line of the railroads is greater than the accumulation by the natural unchecked growth.

An Early County correspondent says the boxing of timber for turpentine results in a very poor, soft lumber.

A Fayetteville correspondent gives the warning that unless good laws are enacted and enforced to prevent fires, the destruction of the forests is not very far in the distance.

From Hall County comes the report that insects have pretty well killed out the chestnut tree, which was originally plentiful in this country.

A Lincoln County correspondent, in speaking of that section, says, it is a cotton belt; that forest timber was cut down by the negroes during slavery, and that it is very scarce There is an insect destroying nearly all of the oak timber.

A Madison correspondent says the long, hot drought of the summer of 1883 has injured our forest by killing out principally the chestnut and checking the rapid growth of timber, except the locust and sassafras.

A correspondent from Parramore says the timber is nearly all boxed for turpentine. About 10 per cent. of it dies every four years; the fires prostrate very much and destroy all young timber.

A correspondent from Raccoon Mills says a great deal of timber is injured and killed by the borer.

A Thomas County correspondent says the turpentine business destroys more timber than the mills. After the timber is "boxed" for three or four years the fire is let in by carelessness, and in a few years the timber is almost destroyed.

From Vienna comes a correspondent's complaint that the timber is wantonly violated by the turpentiners. He says: "These gentry are sapping the earth, destroying millions of fine timber, and ruining the labor of the land. These people should be controlled by appropriate legislation, confining them to the scrubby and inferior growth of timber, or by not allowing them to box the trees until the saw timber has been cut off."

A Wayne County correspondent says the manufacturers of naval stores, after using the forests a certain number of years, generally three or four, they are left, and the annual burning of the woods by farmers becomes very destructive.

An Alice correspondent states that the turpentine damages 25 per cent. of the value of the timber, and, consequent upon the decay and fires, the result is that 50 per cent. is damaged for general manufacturing purposes.

A Blairsville correspondent states that in the springs of 1881 and 1882, a countless number of worms in that vicinity, known as the urch worm, killed about 15 per cent. of the hickory timber.

A correspondent from Cherokee Mills says that the forest should be left alone from April to September; that injury to the forests occurs by letting the stock constantly on the land. Destructive insects are produced by the decomposition of the fallen timber during the summer months.

A Dowdy correspondent thinks the greatest damage done the timber is by the ax.

From Exeter comes the complaint of the turpentine business, it being charged that it will ruin the land and timber quicker than anything else.

A Fayette County correspondent says that cutting the timber in May, June, and July causes worms to work in the timber.

A Lexington correspondent states that original forests will soon be numbered with the things of the past; that large quantities of pines are blown down by storms, and ruthlessly deadened by the clearings of each year.

A Pierce County correspondent says it will pay to work turpentine only about three years, consequently the entire country is being rapidly despoiled of its largest and oldest forest trees.

From Red Clay the report is that the greatest injury arises in failing to burn up the scrubby undergrowth.

A Thomaston correspondent says, "The idler is our biggest curse." He enjoys striking a few blows of the ax in a good-looking lumber tree.

A Wayne County correspondent says the turpentine business will

ruin all yellow pine forests in Southern Georgia in two years. Lumbering is not injurious unless the forests are cut in the month of August.

A correspondent from Cuthbert says that one-third of the timber is lost on account of our lumbermen taking only that part of the tree free from knots, leaving the rest of it to decay in the woods.

An Enville correspondent says the naval-store operations are destroying the forests.

From Atlanta comes a report that chestnut timber is dying from a lack of potash in the soil; the forests are healthy when properly burned over every spring.

From Habersham County the report is, that the greatest injury done to the timber comes from the forest fires. The worms or bugs confine their operations to tree-tops, chiefly in large cutlings, though they injure the chestnut.

From Whitfield County it is reported that the bugs in some localities have swept the pine timber.

A Milledgeville correspondent says that long leaf yellow pine is being fast consumed, and none is coming on except old field pine, which is worthless for building purposes.

A correspondent from Winterville urges that all the States ought to pass laws to protect their timber and encourage the growth of more. The great hope is to raise timber, which will some day become profitable. Timber of all kinds is being destroyed in various ways with alarming rapidity.

KANSAS.

Circular B was sent out to 108 different places; reports have been received from 32.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material?

The reports show 20 saw-mills, 1 shingle-mill, and 1 planing-mill.

4. What is the average number of logs required for making 1,000 feet of boards?

Six mills report 6; five, 5; four, 3; two, $2\frac{1}{2}$; four, 2; one, $3\frac{1}{3}$.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The aggregated reports are as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	3,331	3,388
Laths	do..	.....	1,650
Shingles	do..	.....	250
Total		3,331	5,788

6. What suggestions can you offer as the result of your observation or inquiries in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

A correspondent from Allen County says the young growth of timber has wonderfully increased there since the prairie fires have ceased in consequence of the county being fenced and farmed.

A Franklin County correspondent complains of too free use of the ax. Trees should be planted and timber saved. Since prairie fires have been stopped, there is nearly double the area in growing timber

of that in 1856 and 1860. There are, however, but few of the largest trees standing in the forest.

From Jewell County comes the report that the old trees have been cut off and young timber is growing rapidly. Their fire-guards keep the fire out of the timbers.

A Lakin correspondent is convinced that by judicious planting, intelligent care, and cultivation, in a few years there can be ample forest supplies for many purposes.

A correspondent from Labette County says timber grows well there, and there is nothing to retard its steady growth. Relief from taxes might induce parties owning timber to let it remain as such, and encourage raising it.

Reports come from Lyon County that timber is growing very fast, as most of the old timber is being cut out to give the young growth a better chance, and the result is that timber is about as plenty as twenty years ago. There is some damage, however, done to young timber in the winter-feeding of stock, where the trees are barked by them.

The report from Chase County is that timber is growing very fast where protected from fires.

A Neosho County reporter says most of the timber land is being cleared off for agricultural purposes, from the fact that it is generally our best land. The way the timber is being slashed and cut it will be gone in a few years.

An Ottawa County correspondent thinks there should be encouragement to set and maintain forest timber. Transplanted cottonwoods on high lands seem to be affected by the drought and borers, while hard woods do well.

A Rice County reporter states that the woodman's ax has caused the original forest to disappear there.

A Washington County reporter says the forest fires are caused from railroad engines and from the "pure cussedness" of the small boy and the meaner man.

A reporter from Wilson County says that timber is abundant on Fall and Verdigris Rivers, and thousands of acres are planted and tended on the prairies, where trees grow fast.

A Jefferson County reporter says the saw timber is becoming very scarce. Farmers generally think it pays better to farm their lands than to grow timber.

A Douglas County reporter says fires originate with campers, who seek the timber groves for shelter and for fuel. In order to facilitate grazing on the prairies the herders burn the dead grass; the fires escape and sweep through the young forests. Severe penalties should be fixed by law to prevent this. Injuries to woodlands come from a reckless cutting off of young forests, with no regard for the future demand. Artificially planted forests suffer in dry seasons or from neglect by attacks of borers, and are at all times liable to the attacks of defoliators.

A Springdale reporter says that good oak trees were hacked by the early settlers at the butt and much damage done by prairie fires in early times, causing an average loss of 40 per cent. in damaged and refuse timber.

7. In the cutting of timber for sawing or manufacture is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

Of the reports received nine state "no limit;" two, 10 inches; two, 12 inches; one, each, of 6 inches, 14 inches, 17 inches, 18 inches, and 20 inches.

8. What kinds of timber are chiefly used in your business and the relative amount of each?

The reports show 15 of oak, 13 of walnut, 12 of cottonwood, 11 of elm, 10 of sycamore, 9 of hackberry, 9 of hickory, 3 of maple, 2 of linden, 1 of ash, and 1 of pecan.

KENTUCKY.

There were 476 circulars B sent out; reports were received from 71.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material?

Reports show 63 saw-mills, 4 shingle-mills, 2 planing-mills, 2 stave machines, a sash, door, and blind manufactory, 1 machine for bending felloes, 1 machine for making balusters.

4. What is the average number of logs required for making 1,000 feet of boards?

Three logs are reported by 21 mills; four, by 17; five, by 6; three and one-half, by 4; two, by 3; seven, by 2; ten, by 2; two and one-half, by 1; eight, by 1; twelve, by 1.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The aggregated reports show the following products:

Products.		1882.	1883.
Boards and other sawn lumber	M..	60,971	68,871
Laths	do..	6,080	3,545
Shingles	do..	11,550	12,100
Staves	do..	5,210	3,422
Other principal products:			
Tobacco sticks	do..	100	200
Wagon felloes	do..	200	800
Hickory ax-helves	do..	350	150
Total		84,561	89,088

6. What suggestions can you offer, as the result of your observation or inquiries, in regard to the origin and extent of forest fires and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

A correspondent from Albany, Clinton County, reports that "the woods are set on fire in order to get the nuts, which very much injures the range and timber. Hang the scamps!"

A reporter from Berea, Madison County, says a law well enforced against setting leaves on fire and dropping cigars in very dry times would protect the forest greatly. Fires at times are as hard to manage as a cyclone.

A Butler reporter says the wood in Kentucky forests being hard, the trees are harmed but little by the running fires.

A Cornwell reporter says fires break out in the spring and fall all through the forest. It is caused by farmers clearing up ground and by burning log heaps.

A Frankfort reporter says the timber on the streams of the Kentucky River is now being rapidly cut. It requires from two to five miles of hauling for the best character of timber.

From Glenwood the report is that the present forest will be totally exhausted within ten years if the present state of things exists.

The Grant County reporter says there is a good supply of oak timber, some poplar, and a little ash; but the walnut is about all gone.

The report from Greenville is that about one-half of the forest supplies have been worked up during the last five years; oak is worked up very fast, and poplar will not last five years.

A Harlan County reporter says that most all the mountains are burned over every year. A strict enforcement of the laws would be the only prevention. Forest fires are generally caused by carelessness of settlers in burning off cleared lands.

A Henderson County reporter says there seems to be a general recklessness in the wholesale destruction of timber; something should be done to stop it.

A Hickman reporter states that the overflow of the Mississippi River does considerable damage to the timber. There are no fires.

A reporter from Junction City says the fires are caused by the careless use of fire in the forest and the carelessness of hunters in throwing down lighted matches.

A Newport correspondent says if all trees were saved after salable timber was cut, our forests would be sufficient for our wants.

A reporter from Peach Orchard, Lawrence County, states that the railroad engines and careless woodsmen produce forest fires. There should be a law to arrest these persons and punish them for their culpable carelessness. Woodlands could be maintained here by stopping the *tie* business.

A Ricedale correspondent says fires are generally started by hunters, which destroy the young growth, and in its place comes the detestable greenbriar. Our waste fields should be set in black walnut.

A Salyersville correspondent says there are large tracts of timber land in Northeastern Kentucky which should be purchased by capitalists and the lumber preserved for future uses.

A Pittsburgh, Laurel County, correspondent says fires originate generally from carelessness of farmers leaving fires in their fields when clearing up rubbish and preparing for the spring crops. The high winds blow the fire from the brush or logs left burning into the woodlands, and it becomes hard to extinguish.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

Twenty-four of the reports show "no limit;" nine show 12 inches; eight, 18 inches; three, 10 inches; three, 15 inches; three, 8 inches; three, 20 inches; four, 24 inches, and one, 16 inches.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

Fifty-one reports give oak; 50, poplar; 31, walnut; 17, ash; 17, pine; 11, gum; 8, beech; 7, sycamore; 6, chestnut; 5, cherry; 2, maple; 11, hickory; 1, cottonwood; 1, cypress; 1, butternut, and 1, linn.

9. MISCELLANEOUS REMARKS.

An Albany reporter says the walnut timber is nearly all gone, and while there is an immense amount of poplar, it costs all it is worth to get it out. Should timber be destroyed in the next twenty as it has been in the last twenty years the timber will be gone.

A Berea reporter says the timber is dying from drouth on the dry ridges, and in exposed parts it severely freezes. In coves, glens, and flat valleys, where a good coat of leaves is on the ground, it grows in a sound condition.

A Cadiz reporter says timber is being rapidly used up in this section. The best white oak is made into staves and shipped to New Orleans; poplar is shipped to different points.

A Clinton reporter says our timber is now in creek bottoms, and is being destroyed by overflows made frequent by clearing the hill lands for cultivation of grain crops.

A Danville reporter says there is an insect that works on the very fine oak timber of Laurel and Rock Castle Counties.

The same report comes from Daviess County, with the further statement that the worm is in other timber.

A reporter from the Falls of Rough states that the forests are being rapidly destroyed in the manufacture of staves and sawed lumber.

A Frankfort reporter says black walnut grown in the blue-grass region of Kentucky is subject to wind shakes and yellow streaks, which are more or less indented with worm-holes. The reason of this is not yet understood.

A Glenwood reporter says timber is wasted by hunters. They take but a small amount of the timber they cut, worms devour what is left, and the rot completes the destruction.

A Grant County reporter says tobacco-raising, which requires new land, is doing great injury to timber land.

A Hamilton, Boone County, reporter says there is fully two-thirds of the timber here cut and burned, so that tobacco may be raised. A bug is killing the black locust, which is our most valuable timber.

A reporter from Harlan says the chestnut and chestnut-oak are greatly injured by the prevalent forest fires. The lumber trade is carried on by parties who buy the logs and float them down the Cumberland River to Williamsburg, Burnside's Point, and other places, where they are sawed.

A hematite-furnace reporter says charcoal is manufactured largely from the cullings of the second growth.

A Henderson reporter says the farmers are cutting the trees and burning great quantities of timber to clear the ground. Something should be done to stop it.

From Hickman come the reports that heavy winds injure the forest, and though this damage is infrequent, yet walnut is almost gone, and ash is disappearing fast.

A reporter from Long Falls Creek says worms are very destructive to large oak timber in the lowlands. They are found mostly in timber 3½ feet in diameter and over.

A Monroe County reporter says there is a bird-peck that makes a streak in the sap or white of hickory timber which results in great injury.

A Newport reporter thinks it would be better to let the lumberman alone and go for the farmer, for the farmer cuts the larger percentage of the trees for clearing.

An Owensboro' correspondent says that in the last five years 20 per cent. of the hickory timber has been damaged by worms. They kill the tops of the trees.

A Parksville reporter says the white oak of that section is being cut to make standard-oil barrels.

A Peach Orchard reporter says man's avariciousness in that locality causes the big trees to be taken for lumber, and the others for charcoal and hoop-poles, and the section is rapidly becoming treeless.

A Pittsburgh reporter says there is plenty of young timber growing up that would serve the next generation, if fires could be kept out.

A Ricedale reporter says most of the timber now dying is in the swamps where the wash is received from cultivated farms. Cyclones have greatly damaged the forests.

A Trigg County correspondent says timber lands there sell from $2 to $15 per acre, where land is good for cultivation.

LOUISIANA.

Circular B was sent to 207 places; returns have come from 25.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material.

The reports show 24 saw-mills and 5 shingle-mills.

4. What is the average number of logs required for making 1,000 feet of boards?

Six reports indicate 3 logs; three, 4 logs; two, 1 log; two, 3½ logs; two, 6 logs; one, 5 logs; one, 2½ logs; one, 10 logs.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The summary is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	41,566	43,300
Laths	do..	6,000	7,000
Shingles	do..	1,345	20,130
Staves			
Square timber	do..	88	
Cross-ties	do..	55	40
Total		49,049	70,460

6. What suggestions can you offer, as the result of your observation or inquiries, in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

A report from Amelia states that this section of Louisiana has its swamps more or less subject to tidal flows. Therefore, there is no damage by fires.

An Almadane reporter thinks annual fires are beneficial for the purpose of preventing an accumulation of foliage, which, if allowed to accumulate, would destroy the timber if it should accidentally get on fire.

A reporter from Bossier Parish considers the supply there almost inexhaustible until railroad facilities are opened up.

A Baton Rouge reporter says there is considerable loss in cutting anticipation floats that do not come annually, through sap-rotting and sinking. This can hardly be avoided, as perfectly green cypress sinks.

A reporter from East Baton Rouge Point says they have had no fires since 1874.

A Lake Charles reporter suggests a Government bounty for production of forests, which, unlike the protective tariff, would be equal and uniform, benefiting all.

A New Orleans reporter says the turpentine orchards are very destructive. Farmers burn the grass to get fresh supply for cattle, which destroys a great deal of timber and many young trees.

A Springfield reporter suggests that a proper time be set for burning woods, and a heavy fine lie against those persons firing before or after the time; the informer to have one-half, and the rest go to the State.

A Tangipahoa reporter says forest fires are started by tramps and irresponsible parties during the summer.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

Three reports give no limit; three, 16 inches; three, 10 inches; two, 12 inches; two, 18 inches; two, 20 inches; one, 15 inches; one, 17 inches; one 24 inches; one 14 inches.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

Fifteen reports give pine; 13 reports, cypress; 5, oak; 2, ash, and cottonwood, gum, hickory, poplar, spruce, each 1.

9. MISCELLANEOUS REMARKS.

A correspondent from Almadane says that in 1880 some pine timber died because of rain in summer.

A reporter from Bossier Parish says the greatest destruction of timber is by hurricanes and hard winds.

From Caldwell Parish the report is that six or seven cyclones have passed through there within five years, causing great destruction to timber.

A Franklinton reporter says that hundreds of acres of pine timber are ruined every year by persons going into the woods pretending to make homesteads. After belting the trees on 160 acres they abandon it.

A New Iberia reporter says the ax-man is the only enemy to our cypress swamps, and at the present rate of destruction Louisiana will see the last of her cypress within twenty years.

A New Orleans reporter says a great deal of timber is stolen from homesteads and from Government lands. A great many small trees are cut for railroad ties.

A Montgomery reporter says bugs here are very destructive in June and July, and the logs must be speedily sawed to save them from worm ravages.

A reporter from Saint Tammany Parish complains of turpentine factories.

From Tensas Parish the report is that an insect called a borer destroys the timber after it is down, unless the timber is kept afloat.

In East Louisiana some worm or kind of locust has destroyed all the chinquipins and killed the chestnut.

MISSISSIPPI.

There were 384 of circulars "B" sent out; returns have been received from 55.

1. Nature of the business reported; whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material?

Fifty saw-mills, five shingle-mills, and three planing-mills are reported.

4. What is the average number of logs required for making 1,000 feet of boards?

Nine reports indicate three logs; 9, four; 8, five; 6, six; 3, eight; 2, seven; 2, three and one-half; 1, one; 1, two; and 1, four and one-half.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The summary is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	77,000	88,950
Laths	do..	4,000	8,000
Shingles	do..	8,345	21,380
Staves	do..	.....	.....
Other principal products:			
Square timber	do..	83	.....
Cross-ties	do..	55	40
Total		89,483	113,370

6. What suggestions can you offer, as the result of your observation or inquiries, in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

A reporter from Aberdeen says timber is so plentiful that no one there has hardly ever given the matter a thought as to preserving the forest.

An Austin reporter states that timber is in abundance, but is most wastefully used.

A reporter from Concordia, Bolivar County, says there are some fine brakes of cypress timber back from the Mississippi, which the Memphis and Vicksburg Railroad will develop when it is completed.

A Columbus reporter says most fires here originate from night hunters. Burning forests in autumn kill undergrowth and improve large timber.

A reporter from Dickey says there is an immense amount of pine timber in the southern portion of the State, but it is not convenient to transportation.

A reporter from Enterprise says forest fires are almost always the result of gross carelessness or maliciousness, and those who start them should be severely punished. The trespassing turpentine-men do the timber tenfold more harm than fire.

A reporter from Franklin County says forest fires in this section usually result from fire left by wagoners on the roadside where they camp; they are not extensive, and soon stopped.

A Friar's Point reporter says that forest fires do not injure the timber in the river bottoms.

A Hancock County reporter says there is little hope of controlling forest fires, as some mean men will set fires in spite of everything.

Reports from Handsborough are that forest fires in that section originate principally from stock-raisers, burning to improve the range. The grasses are of short growth, and do not furnish material for very extensive fires. It is not generally considered that these fires are very injurious to timber. There should be a law prohibiting the cutting of timber for market below a certain size, which would allow forests to fill up in a few years; say, in this section, to cut nothing less than 16 inches at the small end of the log, or a corresponding size at the butt.

A Harrison County reporter says forest fires in out-timber lands occur annually from December to March, but they do little injury to timber.

A Jones County correspondent says the origin of the forest fires is believed to be mostly the work of stock-thieves.

A reporter from Lawrence County says to maintain the woodland in Southern Mississippi there should be a repeal of the pre-emption or homestead law.

A Le Flore County correspondent says the woodlands are almost worthless in the market, any amount of timber being deadened in each year.

A Magnolia correspondent says the forests are burnt annually for the purpose of benefiting the pasture. No damage is done to the timber, as the long-leaf pine is not affected by fire except where it has been "boxed" for turpentine.

A Matthews correspondent says it should be made a criminal offense for parties wasting the timber, as it is done in the South. Thousands of trees, if worked into rough boards, would be worth $30 each; yet these are frequently cut down and left to decay for the sake of getting the grapes that frequently cling to them.

A Montgomery County correspondent says this is a great timber region, and the Department should send a man to live there until he thoroughly understands the situation, and no doubt means could be found to renew the forest. This would be particularly desirable, as the soil is poor.

A Moss Point reporter says the forest is usually burnt out every spring. When so burned each year, the grass is not thick enough to produce fire sufficient to kill the pine trees. If let alone, the unburned grass and leaves would accumulate so much that when the forest was fired the trees would be destroyed.

An Oxford reporter says pine is the main timber, which is very plentiful. Old fields, when turned out, soon produce a fine crop of timber.

A Pearlington reporter says the greatest destruction to the forests is caused by "boxing" the trees for turpentine.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

The report shows no limit, 15; twelve inches, 12; ten inches, 8; sixteen inches, 3; fourteen inches, 2; eighteen inches, 3; thirteen inches, 1; fifteen inches, 1; twenty inches, 2; twenty-four inches, 1; eight inches, 1.

8. What kinds of timber are chiefly used in your business, and the relative amount of each.

In the reports 34 present pine, 25 oak, 21 cypress, 13 gum, 11 poplar, 7 ash, 5 hickory, 2 walnut; cedar, chestnut, and cottonwood, each 1.

9. MISCELLANEOUS REMARKS.

The clearing made by small farmers in the vicinity of Aberdeen has caused the worms to get in the surrounding timber, and they destroy large quantities. Here is the finest red gum in the world, and there is plenty of beech, hickory, and white oak.

An Austin reporter says large quantities of timber are destroyed by deadening.

A Columbus reporter says a great deal of timber was destroyed by a cyclone in May, 1882. Many oaks were killed by the excessive dry summer. As timber is destroyed summer rains are less frequent.

A reporter from Corno Depot says, in the spring and early summer we have high water. In these low lands there is a souring of the sap.

A reporter from Greenwood says, we have the largest supply of fine timber and the best country in the world.

A Handsborough reporter says nothing seems to hurt or damage the yellow pine here except tapping for turpentine.

A Jones County reporter says the turpentine manufactory destroys more forest timber than all the insects, forest fires, and cyclones combined, though there have been more forest fires this year in this county than in many previous years.

A Lawrence County reporter says the only damage to forests in this section comes from the belting of timber by persons pre empting land. Frequently a colored man will pre-empt 160 acres and belt the timber on about 40 acres and then leave it, and this causes great destruction.

A reporter from Sheppardtown, Le Flore County, says they have the finest forests in the world, thousands of acres of cypress, gum, hickory, and oak, and there is nothing but the hand of man to destroy them as he needs the land for cultivation.

A Lena reporter says their timber has died out in considerable quantities, either from insects or dry weather.

A Magnolia correspondent says the greatest injury to woodlands that we notice is being done by butchers of wood who call themselves sawmill men, but know little of the business. Another destruction is from small settlers, who deaden the timber, and much of the land is of little use after the timber is dead. This is done principally by negroes.

A Matthews reporter says the red oak is dead on thousands of acres, and it is liable to become an extinct species. The cause of its destruction is supposed to be from the caterpillars, which ate the foliage a few years ago.

A Montgomery reporter says the people seem to place no value on the timber, and they waste it fearfully. The railroad companies give out small contracts for wood and ties, and thus many fine forests are destroyed, being cut into just enough to set the worms at work.

An Oxford reporter says they have oceans of good hickory there which is of no use to them. In the spring the storms break down the timber; the worms come into this, and then get into the live trees, and thus very much of the valuable timber is killed out.

A Panola County correspondent says a few years ago a good deal of injury was sustained by the caterpillar. It stripped the foliage off of oak. More destruction is done by clearing land. Millions of feet of the best kind of timber are thus destroyed yearly.

A Paulding reporter says the timber is so abundant there is great waste in its use. Insects do little damage.

A Pearlington reporter says some swamp white oak was killed this year by drought. Fires have done but little damage.

A Scranton reporter says it is customary for stock-owners in the pine woods to fire the grass in the early spring in order to obtain fresh grass. These fires often do much damage to the smaller growth of forest trees, and also to trees that have been tapped for turpentine or are in any way exposed.

A Theo reporter says some timber is lost by worms and a good deal by hurricanes. There is not near as much spoiled by men clearing up land as formerly.

A Tippah County correspondent says the oak timber is greatly damaged by worms, and all of it more or less damaged by storms. Considerable damage is done by the "clearings."

A Tishomingo reporter says very large belts of oak timber in that country were destroyed by worms three years ago. This year a great deal of pine has been destroyed by them.

A Waynesborough reporter says the injuries are from boxing for turpentine, but considerable timber is cut for cross-ties for the railroads.

MISSOURI.

Circular B was sent to 557 places; returns were had from 77.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material?

There are reports of 74 saw-mills, 3 planing machines, and 1 stave-machine.

4. What is the average number of logs required for making 1,000 feet of boards?

Nine report 3 logs; eleven, 5 logs; eight, 6 logs; ten, 8 logs; seven, 4 logs; six, 8 logs; six, 10 logs; three, 2 logs; three, 2½ logs; one, 1 log; one, 3½ logs; one, 9 logs; and one, 12 logs.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The aggregate reports show as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	63,017	74,300
Laths	do..	4,190	10,097
Shingles	do..	4,830	5,791
Staves	do..	5,150	2,300
Total		77,187	92,488
Other principal products:			
Oak slabs	cords..	200	600
Wood	do...	1,000	1,500
Railroad ties	do...	2,700	1,100
Axletrees	do...	5,000	3,000
Wagon-tongues	do...	2,000	2,500

6. What suggestions can you offer, as the result of your observation or inquiries, in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subject of utility in reference to forest supplies?

A reporter from Adair County says: "We have fires here every spring or fall, which very much damage the young timber. The timber is about all cut off for improving farms, building houses and bridges, and for railroad purposes in this county."

A Brunswick reporter says he thinks it is an advantage on the river bottoms to have occasional forest fires.

A Gainesville reporter says forest fires do not bother them there, and timber is plenty; but, at the rate it is being cut, it will not be many years until sawing will be a thing of the past in that section.

A Cape Girardeau correspondent says their timber lands are known as *swamp* or *overflowed* lands, hence there are no fires. Cypress, oak, and gum are abundant.

A Castor reporter says the yellow pine forest might be better were it not for fires being set out, which destroy the undergrowth, as well as much of the full growth.

A Chillicothe reporter says their timber is not hurt by fires, but it is used up very fast, and most all of the good timber has been sawed.

A Crocker reporter says the forests there suffer from fires, and young white oak timber is being rapidly used up for railroad ties.

A De Kalb County reporter states they have had no forest fires there for the last fourteen years.

A Frankford reporter says the owners of timber are very saving of it, and there have been no fires for twenty years.

A reporter from Hilbert, Butler County, suggests that a reward of from $50 to $100 be offered for the conviction of any and all persons

caught setting fire to the forests, and that taxation be removed from all timber reserves, and each county pay the owner once in ten years a bounty on a ten, twenty, or fifty-acre timber tract, as it may be.

An Indian Springs reporter says forest fires occur in many ways and do great injury to the timber. There should be a law preventing firing the forests.

From Iron County comes the report that fires generally originate from the pure "cussedness" of some irresponsible person, and occasionally from camp fires. They will continue until the people combine to prevent them. The act of firing should be made felony. Assistance from the General Government is not needed here and possibly never may be.

A Leesville reporter says, while the fires damage timber to some extent, they kill out the undergrowth to the advantage of the larger timber. Firing is done mostly in the grazing interest.

A Little River reporter says they have no forest fires, and the timber supply appears almost inexhaustible.

A Memphis reporter says timber in on the decline there on account of consumption and decay, but not from fires.

A reporter from New Madrid County says their principal timber grows in swamps, and it is floated in high water. There is no trouble with forest fires.

A Putnam County reporter says the larger timber is cut for ties and piling; the smaller, for hoop-poles.

A Panther Valley reporter says timber grows there faster than it is destroyed. Fires originate from hunters and travelers.

A reporter from Portland, Callaway County, says the railroad companies have played havoc in that country. Since 1856 there have been no injurious forest fires.

An Ozark reporter says forest fires do not injure the oak much, and can only be controlled by stringent laws.

A Saint Louis reporter says woodmen should be required to gather together the tops and branches of the trees they have cut for timber and burn them in safe places.

A Wayne County reporter thinks forest fires once a year are an advantage to pine timber, but disadvantageous to other timber.

A Winston reporter says firing the forests would stop to a great extent were it made a penitentiary crime and the law enforced.

A reporter from Wheatland, Hickory County, says the fires every spring that the cattle-men set out keep the growth of timber down. It will thus remain unless the Government protects its agents.

A reporter from Nodaway County says there have been no forest fires there for many years. In the west part of this county is Platte River, with a strip of timber on it from one-half to three-fourths of a mile in width. Grand River, with its east and west forks, has some of the finest of white oak timber on either side of it from one to three miles in width. It is being cut off quite rapidly.

7. In the cutting of timber for sawing or manufacture is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

Twenty-one reports show no limit; fourteen, 10 inches; twelve, 12 inches; four, 24 inches; three, 14 inches; three, 16 inches; two, 6 inches; two, 18 inches; one, 8 inches; and one, 21 inches.

8. What kinds of timber are chiefly used in your business, and the relative amounts of each?

The reports show 52 of oak; 23 of walnut; 16 of cottonwood; 16 of

ash and elm, each; 17 of hickory and sycamore, each; 14 of pine; 10 of poplar; 9 of gum and cypress, each; 13 of maple; 6 of linden; 2 of birch; 2 each of cherry, hackberry, and sassafras.

9. MISCELLANEOUS REMARKS.

An Adair County reporter says there would be an abundance of timber here in a few years if fires were kept down. As the old timber is cut and the tops lie rotting on the ground, when fires break out it is sure destruction to young timber, which stands thick on the ground and is nice and straight, from one-half inch to eight inches in diameter.

A Brownwood reporter says that in Southeast Missouri the white-oak timber is injured by overflow; that is, where timbered lands remain covered with water for six months of the year. Unless this country is drained, an immense amount of the finest timber in the world is unavailable and in time will be worthless.

A Brunswick reporter says a tornado destroyed vast quantities of timber here in the summer of 1883. Much of it rots in the woods. Barbed wire is fast doing away with the demand for fence boards, and iron roofing for shingles, and in time iron posts for fencing will be generally used. Great quantities of hickory nuts, walnuts, and pecan nuts can be found in the river bottoms, which might be had to plant, and vast amounts of young cottonwoods and soft maples could be gathered, bunched as Osage orange plants are, and shipped for the western prairies. The river banks and bars are lined with the little trees during the autumn.

A Cape Girardeau reporter says that with an experience based on 20 years' woods life and lumber business in Michigan, Indiana, Kentucky, and Missouri, I would say that the timber of this portion of the country is well preserved, being protected from fire and insects by frequent overflows. The greatest injury has come from hurricanes.

A Castor reporter says he has known many acres of pine destroyed by worms from the cutting of a few trees in midsummer. Winds and tornadoes have latterly harmed the forests very much.

A Chillicothe reporter says a cyclone destroyed a vast amount of timber on Grand River in the summer of 1883.

A Crocker reporter says a great deal of timber is wasted for fuel and fencing and by burning the woods late in the spring, destroying the young plants.

A reporter from De Kalb County says they are having a splendid growth of young timber in that county.

A Fayette reporter says sleet has been the greatest injury to the timber.

A reporter from Gallatin, Daviess County, says the timber there is growing smoother, as fires from the prairies are closed out.

A Frankford reporter says a large part of the largest timber is decaying from the fires of years ago, and a small quantity is killed by storms.

A Hilbert, Butler County, reporter says the ash timber is nearly all dying from the effect of annual fires. After its bark is blistered by the fire, insects attack and expedite its decay. Our rivers overflow their banks with more destructive tendency than they did thirty years ago. This may be attributed to clearing away our forests, the many trees of which assisted in reserving the moisture, preserving intense evaporation, causing rain oftener, but of much less volume. The enactment of the most stringent laws devisable for the prevention of fires and for the

encouragement of reserves of timber is advocated. The country will soon become a vast barren, void of timber, with many of its best and finest varieties entirely extinct, at the rate of destruction now obtaining.

A Howard County reporter says a great deal of timber is destroyed by insects in time of droughts.

An Iron County reporter from Annapolis says there is no injury to timber from insects sufficient to attract attention. The severe drought of 1881 killed out patches of timber on hillsides, where strata of porphyry and limestone appeared near the surface.

A reporter from Ozark Mills says near the line of railroads the timber is fast disappearing for lumber and coal purposes. When it is cut off there follows a heavy growth of brush, almost impenetrable; in the autumn the hunters from the north set fire in the thickets to run the game out, then forest fires destroy the growth of timber.

A reporter from Leesville says the borers are destroying the black oak to some extent, while other kinds of timber escape their ravages. We have abundance of timber suitable for railroad supplies, and wagon material of splendid quality. The Government should encourage the raising of walnut timber.

A Madison reporter says forests should not be burned over for range purposes, for the fires kill and stunt many trees and injure the quality of many. The frequent fires in forests is the worst thing happening to them.

A Memphis reporter says the timber there is suffering from heart-rot, caused by the sap of old knots running down the inside of the tree. Hickory timber should be cut in June and July or it will become wormy or powder-posted in a short time after.

A reporter from Miller County says the timber is best on north hillslopes and most defective on the south side of hills. It may be that in summer extreme heat affects that growing on a rocky bed.

A New Madrid reporter says the cypress reaches a size of from 4 to 6 feet through at the ground, and there is a body 90 feet in length before the limbs are reached. The greatest injury comes from lightning and storms.

An Oregon, Holt County, reporter says during the past year about 10,000 cords of oak and cottonwood have been cut, chiefly oak. If this cutting continues, Holt County timber land will soon be destroyed.

A reporter from Omaha, Putnam County, says drought, fire, and worms are chief causes of injury to timber. The choice sugar orchards, an abundance of brush, and worthless timber for fuel, are all that is left.

Reports from the Poplar Bluff state that timber is wantonly slaughtered by stave-men in the manufacture of West India and other oak staves; about one-third of the tree is used, and often 30 feet in length of trees are left to rot that would measure 40 inches at the small end. The white oaks of different species are very thrifty and attain great size in that locality. For two years a worm or caterpillar has stripped the oak and gum timber of leaves. The worms disappear in May or June, and the leaves put out again.

A reporter from Hardin, Ray County, says black walnuts and cottonwood grow rapidly, the latter doing better on bottom land.

A reporter from Portland, Callaway County, states that in five or six more years they will be obliged to get lumber from some other State. The forest will not last much longer here at the rate it is being destroyed by everybody.

The Wayne County reporter says they have observed for years that

there is no pine growing to fill the place of that cut for timber, and in a few more years, after the present growth of pine is cut, it will be scarce and very high. The chief trouble to timber is worms. An insect lays an egg in the spring in any decaying timber, chiefly working in pine or hickory. This hatches out into a worm and in such large numbers that they often attack neighboring trees that are sound, bore into them, and often kill from one to two acres in a place.

A reporter from Wheatland, Hickory County, says fire is the worst enemy to Government lands there; the ax is next. If the fire was kept out of the woods the advantage to the country would be as great for hog-raising as it is now for cattle, to say nothing about the increase of timber. Having lived in five different States, the reporter says he has never seen a soil that would produce timber so rapidly as the poorest soil there.

A Wolf Island reporter says considerable timber is cut and stolen by raftsmen.

NEW MEXICO.

Circulars were sent to 32 places; returns have been received from one.

From a Fort Wingate reporter we learn of an establishment where lumber, laths, and shingles were manufactured. Answers to questions are submitted as follows:

4. What is the average number of logs required for making 1,000 feet of boards?

Four.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The aggregated reports show the following:

Products.	1882.	1883.
Boards and other sawn lumber.....M..	300,000	300,000
Laths.....do..	40,000	40,000
Shingles.....do..	100,000	150,000
Total.....	440,000	490,000

6. What suggestions can you offer as the result of your observation or inquiries in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

There are no forest fires in this vicinity. The timber is watched and protected by troops marching through frequently.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, what is the least diameter or girth that is allowable in cutting trees?

Twelve inches is the smallest used here.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

All pine.

9. MISCELLANEOUS REMARKS.

Pine timber in Northern New Mexico is damaged to a large extent by rot, while the tree is standing and growing.

NORTH CAROLINA.

Circulars were sent to 857 places; replies were received from 98.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material.

The report shows 97 saw-mills, 16 shingle mills, 11 lath-mills, 2 stave-machines, 1 planing-mill, 1 sash, door, and blind manufactory, 3 re-sawing factories, and 1 dry-distilling establishment.

4. What is the average number of logs required for making 1,000 feet of boards?

Twenty reports give 5 logs; seventeen, 6 logs; eleven, 7 logs; nine, 4 logs; ten, 3 logs; three, 8 logs; four, 10 logs; one, 9 logs; one, 4½ logs; one, 2½ logs.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The reports, as aggregated, show the following:

Products.		1882.	1883.
Boards and other sawn lumber	M..	71,565	86,825
Laths	do..	12,594	28,257
Shingles	do..	1,711	45,759
Staves	do..	8,725	30,695
Other principal products:			
Spoke-billets	do..	25	25
Shuttle-blocks	do..	20	20
Heading-pieces	do..	300	25
Blind, door, and sash		400	400
Total		95,540	192,006
Spirits of turpentine	barrels..	2,500	.....
Tar	do....	5,000	.....
Pitch	do....	650	.....
Oil of tar	do ..	4,600	.....
Tackle-blocks		.....	30,000

6. What suggestions can you offer, as the result of your observation or inquiries, in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

A reporter from Alamance County says the original forest is oak. The old, worn-out lands have grown up to pine, and during the last fifty years good pines have grown suitable for saw-logs. An oak grove planted last year is doing well. This year walnuts were planted for wire-fence posts.

A Beaufort County reporter says the supply of timber in that section is being exhausted very fast. There is not much loss by fire except in the young growth.

A Bertie County reporter says they cut out the large timber, and that gives room for the small to grow. The most of the land in this section upon which timber is standing is rated at from $1 to $2 per acre; hence the land is allowed when cut to grow up again in timber.

A Beston reporter says fires in that section are nearly always caused by carelessness of persons kindling fires in the woods and not extinguishing them before leaving. A law making this a misdemeanor would be of service.

A reporter from Caldwell County says for the last 15 or 20 years they have not suffered much from forest fires. If night-hunting was stopped they would be less. There is a large amount of pine timber.

A Cameron reporter says they think certain parts of forestry laws and regulations of Germany would be beneficial in saving the forests.

A reporter from Caswell County says the forest growth has been nearly all cut down. The way to save the forest is to keep the timber standing. But as every foot of land in this section is owned by some person, the timber cutting cannot be prevented.

A Charlotte reporter says forest fires are caused mainly by carelessness in travelers and hunters at night. The remedy would be strict laws faithfully enforced.

A Craven County correspondent says he would recommend a heavy fine and punishment in prison for those who set the forests on fire. As to supplies, Craven County has from 75 to 80 per cent. of its lands in timber.

A Glen Alpine reporter says there are no forest fires in that damp climate and deep woods. The Government should offer rewards for tree-planting and forest culture.

A Hyde County reporter says no care is taken to save the timber because there is no value placed upon it. Not much large timber is injured by fire; small timber suffers to some extent.

A Martin County correspondent says forest fires do not seriously injure the woods, being mostly in swamp or wet lands, and the fires burn the underbrush and the young wood which is too thick and grows spontaneously.

A reporter from Montgomery County says one-third of that county is in pine forests, and they have a vast amount of timber. Opossum hunters cause the greatest amount of forest fires.

A Morganton reporter says in that section no attention has been paid to forestry. The country is naturally well timbered. Fires occur frequently in the mountains and sparsely-settled portions and are set as a supposed benefit to pasturage.

An Oxford reporter says their cleared and cultivated lands grow up in "old field" pines, when the land is abandoned.

A Randolph County reporter says pine forests are nearly exhausted in that vicinity. They are not troubled with forest fires.

A Reidsville reporter says a general stock law would be of advantage there. Fence-building is a cause of greater destruction of timber than all other causes.

A Salisbury reporter says their late stock law accomplished much toward saving timber in that country. Forest fires are mostly caused by using fire in clearing new lands in the winter.

A reporter from Delta, Sampson County, says to prevent forest fires, burn small strips of land in sections of one mile apart to control fire. Stock and the forest fires destroy all the young growth of timber. Pines will sufficiently develop in 20 years to make turpentine; for timber and lumber in 50 years.

A Scotland Neck reporter says in Eastern North Carolina the timber supplies will soon be exhausted. They have no very damaging forest fires.

A Sharpsburg reporter says no effort is being made to restore the growth of the yellow pine, which is being exterminated.

A Stony Creek reporter says what are known as "old field pines" are spreading over old, uncultivated fields in this vicinity.

A Wayne County reporter says fencing the farms destroys more timber than anything else under their observation.

A Wilmington reporter says the yellow pines in this section are nearly all "boxed" for turpentine. This makes them very combustible. The fire burns them partly off and the wind blows them down by the thousands of acres in all of the Southern States.

A reporter from Wilson County says fires are mostly caused by idle laborers hunting and fishing, rather than working. They and the basket-makers take the privilege of cutting any amount of trees.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

The reports show, no limit, 25; 10 and 12 inches each, 11; 8 inches, 4; 6 and 16 inches each, 3; 14, 15, and 17 inches each, 2; 13, 18, 20, and 24 inches each, 1.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

The reports show 80 of pines; 43 of oak; 29 of poplar; 17 of hickory; 6 each of gum and cypress; 9 of ash; 5 of maple; 4 of cherry; 1 each of birch, cedar, chestnut, dogwood, juniper, locust, and persimmon.

9. MISCELLANEOUS REMARKS.

A reporter from Alamance County says in the pine groves the cut-worms destroy a quantity of timber. They commence in the spring of the year in the top of the pine trees and kill and dry up the forests like fires. Cedar and pine are coming up in their place.

A Bath reporter says worms are apt to get into the logs and spread from them to the standing timber, which causes the latter to die. A law should be passed preventing any timber being cut in the summer months.

A Beaufort County reporter says worms get into the standing timber and ruin large tracts in a year or two, with no means of saving except to cut and saw up the trees immediately.

A Bertie County reporter says the greatest destroyer to timber is a small bug that gets in the standing timber when it is cut in August. Several acres are sometimes killed in this way.

A Brittain reporter says chestnut and oak timber are dying out very much from the ravages of insects. Pines grow up in their stead, and in a few years the ridges will be nothing but pine forests on the uncultivated lands.

A Charlotte reporter says a considerable amount of forest and small growth is annually consumed by the people in cities and towns for fuel. Public roads are crowded with wagons hauling wood for at least one-third of the year.

A Craven County reporter says the planting of timber lands is continued by nature from year to year, in the way of seeding old, worn-out lands with pine and other kinds of timber.

A Cumberland County reporter says tapping the trees for turpentine injures their forests more than any other cause.

A Martin County reporter says the juniper trees have been seriously injured by bears in the past. They peel off the bark and suck the juice, and when the trees arrive at maturity they are defective.

A Mocksville reporter says the chestnut, which twenty years ago grew in their forests, is now entirely extinct. Cattle and hogs roaming freely over the forests have caused undergrowth to die, and broom sage, a kind of worthless grass, to spring up and so sap the ridge lands as to damage and kill out the timber.

A Moore County reporter says the greatest injury to the forests is by overworking pines for turpentine. Dry weather kills more trees than the insects.

A Morganton reporter says very little new land is being cleared. The old custom of clearing new land and throwing out the old has been discontinued, the farmers preferring to reclaim the old fields.

A Mitchell reporter says a small black bug destroys vast quantities of pine trees in that section, for which no remedy has been found. These bugs kill the trees in a few weeks by boring innumerable holes in them.

A North Cove reporter says timber should not be cut when the sap is up, for worms will destroy the remaining timber. Young timber will sprout from roots of many kinds and thus soon bring forth a new supply.

An Oxford reporter says they have not had any serious damage to their forest since 1848; then it was damaged by cut-worms.

A Red Banks reporter says the cultivation of turpentine is very disastrous to the pine tree and causes millions of feet to be lost each year.

A reporter from Delta, Sampson County, says the pine belt of North Carolina is being rapidly destroyed, and the chief remedy needed is a "no fence" law. Forest fires and "boxing" for turpentine produce worms. Hogs and sheep destroy nearly all young pines, and forest fires do away with what young trees are left by the stock.

A Winston reporter says there is much oak timber dying in the woods; the cause is not known.

A Wilson County reporter says the greatest injury to woodlands under his notice is caused by careless, non-resident persons cutting trees and firing woodlands by torches used in hunting. Basket and chair makers do considerable damage by trespassing on lands. Rigid laws need to be enforced.

SOUTH CAROLINA.

There were 432 circulars sent out; returns have been received from 45.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material.

The reports show 44 saw-mills, 5 lath-mills, 4 shingle-mills, 2 stave machines, and 1 planing-mill.

4. What is the average number of logs required for making 1,000 feet of boards?

Ten reports show 5 logs; six, 4 logs; six, 10 logs; four, 7 logs; three, 12 logs; two, 3 logs; two, 3½ logs; two, 8 logs; one, 2 logs; one, 2½ logs; one, 6 logs; one, 11 logs; one, 20 logs.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

The aggregate reports are as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	31,475	31,942
Laths	do..	1,653	2,245
Shingles	do..	330	375
Staves	do..	100	75
Other principal products:			
Square lumber	do..	25	25
Cords of wood		1,000	.....
Total		34,583	34,662

6. What suggestions can you offer, as the result of your observation or inquiries, in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

A reporter from Abbeville County says the original forest is nearly all gone, but there is considerable second growth. Fire is mostly caused by hunters.

An Almeda reporter says fires have done but very little damage previous to the cutting of timber for turpentine purposes.

A Beaufort reporter says their pine forest is being consumed very fast, and nearly all that is accessible by water or rail has been used, or it is in a dead or dying condition in consequence of turpentine factories. Fires through turpentine lands are very disastrous. In that section fires are also caused by carelessly handling fire-torches and by sparks from railroad engines. Sometimes the old turpentine boxes are full of crude, inflammable matter, and, taking fire, cause annual destruction of the smaller trees.

A Campton reporter says each farmer should be required to keep in forest 33 acres out of every 100.

A Colleton County reporter says the forests have lost one-third of their timber since the turpentine farms were opened, about 15 years ago.

A Forestville reporter says their supplies of timber are decreasing at the rate of about 5 per cent. per annum.

Reports from Greenville County say they have no fences to keep up and the forests are abandoned. Old field pine grows on land that has been cleared and cultivated. Chestnut and oak trees are nearly all dead from the ravages of the worms, but the young pine succeeds them.

A Hampton County reporter says the county is being divided into numerous farms of which fully one-half are cultivated. Forest fires do comparatively but little damage.

A Hickory Grove reporter says the most damage to forests in that section is from cutting timber during the months of May and June, which starts insects during these periods.

A reporter from Honea Path says woodlands would now maintain themselves by the passing of what is known as the stock law in that State. The origin of fires is from hunters, colored men carrying torch-lights when hunting at night.

A Majors, Anderson County, reporter says burning the forest in the winter season when the sap is out is the best time to prevent disasters to the timber. There will be but little timber left there in the next ten years at the present rate of destruction.

A Spartanburg reporter says a law prohibiting the carrying of torch-lights by hunters in the forest might be practical and beneficial, for many fires originate through the carelessness of hunters carrying torch-lights through the forests at night, and sometimes from the brush heaps and log heaps burned in the clearings.

A Sumter County reporter says the principal cause of forest fires in that section is the carrying of torches by colored people through the woods at night for the purposes of "shining coon eyes."

A Walhalla reporter says the forest fires will ruin the growth of the trees and injure the soil.

A Westminster reporter says to preserve and promote timber lands let them be annually burned off.

A reporter from Johnsonville, Williamsburg County, says forest fires prevent the growth of young pines, yet the absence of fires allows the free accumulation of a growth of short-straw pine which is undesirable, and which grows in such quantities that in many places it chokes out all grass for stock and almost everything else.

7. In the cutting of timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

The reports show "no limit," 21; 10 inches, 7; 8 inches, 4; 12 inches, 3; 4 inches, 16 inches, and 17 inches, each, 1.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

The reports are summarized as follows: Pine, 43; oak, 19; poplar, 7; hickory, 4; ash, 3; gum, 1; and cypress, 1.

9. MISCELLANEOUS REMARKS.

An Abbeville reporter says trees cut down in July get bugs in them, which causes standing trees to catch them; the bugs become worms, and they make holes which destroy the value of the timber.

An Almeda reporter says with the present rapidity of destruction, in 20 years more our forests of hard or yellow pine will be utterly ruined in all the South.

A reporter from Anderson C. H., says their oak forests are gradually dying from unknown causes.

A Beaufort reporter says the turpentine manufacturers or "sap-suckers," as they are called, are destroying the forests to an alarming and serious extent. They should be tarred and feathered; they injure the public without benefiting themselves or others. There are a good many trees destroyed by an insect propagated by a beetle, called the "sawyer." The insects bore into all trees that have been cut and have fallen during the spring and summer months. Should a tree lodge against another and be left, the "sawyer" will attack and kill the green tree.

A Blythewood reporter says pine timber is greatly injured by "boxing" and "blazing" for turpentine purposes. Trees that do not die are damaged very much and the land is sapped.

A Cokesburg reporter says the forests were greatly destroyed, before the war, by clearing lands to enlarge the cotton area. We are now preserving the remnants by requiring inclosure for stock, but not for crops, the "fence law," as it is called. This law prevails by legislative enactment throughout the State. There is no material injury by insects.

A Greenville reporter says the stock law has been in effect four years, and has greatly protected the young timber, though the older trees are dying out. Black, red, and Spanish oak and chestnuts are dying from some cause, and leave a very heavy undergrowth. If this continues for a few years the timber left will be on the water courses. Fifty years ago the mast did much good to the hogs; now there is hardly any.

A Honea Path reporter says in the original forest there is a great deal of red oak dying; it would seem to be from want of proper nourishment of the soil.

A reporter from Majors, Anderson County, says continuous rainfall in spring and long drought in summer, causes much injury to the forests. Heavy sleet has accompanied the wind storms.

An Orangeburg County reporter says turpentining the timber is the principal injury done in that county.

A Palmetto reporter says a great blessing is found in the stock law, which leaves the axman and forest-fire vandal no longer any motive to burn off lands for pasturage of outside stock.

A Richburg reporter says the ax is the fell destroyer of their timber. The "low country" of the State abounds in pine and other valuable trees, which are manufactured into boards, shingles, &c., and sold out of the State.

A Spartanburg reporter says the chestnut trees, very extensively

used in that country for fence rails and posts, are universally dying and are nearly all dead. Standing straight and leafless throughout the forest, they last many years after dying. At the present rate of mortality they will be gone in from five to seven years. The root of the tree seems to be attacked by an insect. The old-field pine soon covers fields thrown out of cultivation, forming a dense forest in from 30 to 40 years. It redeems the land and makes quantities of fire-wood, and is of inestimable value as a reclaimer of old, worn lands.

A Glenn Springs reporter says pine timber grows from a seedling to small saw-log in about 15 or 20 years.

A Williamsburg reporter says the turpentine business is fast killing out the long-straw pine, and hogs eat all the pine mast they can find and devour the roots of every one that sprouts and commences to grow. Millions of seeds fall and sprout, but the hogs do not let one grow in a hundred acres. There is no young growth to take the place of dying trees.

TENNESSEE.

There were 720 circulars sent out; returns were received from 82 places.

1. Nature of the business reported, whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material.

The reports show 77 saw-mills, 7 lath-mills, 5 shingle-mills, 2 stave machines, 2 planing-mills, 1 chair factory, and 1 furniture factory.

4. What is the average number of logs required for making 1,000 feet of boards?

Twenty-four reports give 3 logs; twelve, 2 logs; twelve, 5 logs; ten, 4 logs; four, 7 logs; three, 2½ logs; three, 6 logs; two, 10 logs; two, 2 logs; one, 3½ logs; one, 4½ logs; one, 20 logs.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

A summary of the reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	60,121	60,121
Laths	do..	3,859	3,790
Shingles	do..	5,698	3,200
Staves	do..	1,800	825
Other principal products:			
Wooden pumps		2,110	85,700
Wooden boxes	M..	280	.....
Bedsteads	do..	20	20
Framing lumber	do..	83	21
Hoop poles	do..	20	20
Piling	do..	.....	156
Bed slats, rough	do..	100	.....
Bed slats, finished	do..	70	95
Total		74,161	153,948

6. What suggestions can you offer, as the result of your observation or inquiries, in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

A reporter from Ashland City says the soft timber in the forest is fast melting away, but there is abundance of beech, oak, and hickory. Because of an abundance of small streams in that county there is not much damage done by fire.

A reporter from Austin Mills says poplar and walnut timber is nearly exhausted in this State.

A Bradford reporter says the forests are giving out with great rapidity, and no means are taken to preserve them.

A reporter from Bumpus Mills says the best timber is getting scarce, and there is no remedy save to work it up as close as possible after it is cut down.

A reporter from Carter County says there is cause for serious thought for the future of their forests. They seem to be doomed to total destruction.

A Cerro Gordo reporter says all forest fires here are caused by the carelessness of farmers. The only detriment is simply burning the leaves and parching young timber a little.

A Colesburg reporter says in that immediate neighborhood 40 years ago all the wood was cut for coaling. The trees since grown are now again cut for the same purpose, and they make about 15 to 20 cords per acre. There are no forest fires, but trees should be planted.

A Dyersburg reporter says fires burn the fallen leaves, but they do not affect the green or living timber.

A Gadsden reporter says all the good timber is gone.

A reporter from James County says if forests are burnt during the winter season no particular damage is done.

A Linden reporter says the origin of forest fires in that section is by tanners, who generally set fire to the woods in the spring just before they commence peeling tan bark.

A Livingston reporter says there are no forest fires. There will be a surplus of timber for all ordinary purposes for years to come.

A Nashville reporter says cutting trees for lumber under 18 inches in diameter at the stump should be prevented.

An Obion County reporter says all old overgrown timber should be cut out and let the young, vigorous growth have a chance. There are no forest fires in that section.

A reporter from Pine Land says forest fires in that county occasionally damage the small growth if the fires get in after the sap rises in the spring.

A Pinson reporter says the best thing for the maintenance of woodlands is to stop cutting for railroad and saw-mill purposes.

A Rhea County reporter says almost all of the valuable timber has been cut there. Some fires originate accidentally in farm clearing, but most of them are set by those who do not own land.

A Sunbright correspondent says make the setting of fires a crime punishable by imprisonment in the penitentiary and appoint officers of the secret service to prosecute the offenders.

A Fentress County reporter says the fires there do much damage to the chestnut timber and but very little to other kinds. The law against firing the woods is not much regarded nor enforced.

A Wadeville reporter says the people fire the pine forests in the spring to make ranges for cattle, which does not seriously injure the timber, of which there is abundant supply.

A White Bluff reporter says fires are purposely set there by ignorant people, thinking it will give earlier grazing. There should be rewards for their apprehension and heavy punishment should follow.

7. In cutting the timber for sawing or manufacture, is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

The reports show of "no limit," 27; 24 inches, 12; 18 inches, 10; 12

inches, 8; 20 inches, 6; 10 inches, 5; 16 inches, 2; 14 inches, 2; 15 inches, 1; 9 inches, 1; and 6 inches, 1.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

The reports show 63 of poplar; 59 of oak; 32 of walnut; 30 of ash; 19 of gum; 18 of pine; 18 of hickory; 6 of cedar; 6 of cherry; 2 of cottonwood, and 1 of locust.

9. MISCELLANEOUS REMARKS.

An Ashport reporter says the United States Government has injured timber worse than anything else by cutting down along the banks of the river; some is taken by raftsmen.

An Ashland City reporter says many large oaks are more or less affected by worms, and when the small growth is cut away they become exposed to the sun and begin to die at the top.

A reporter from Bumpus Mills says they have pretty heavy loss in dry seasons from the boring worm.

A reporter from Carter County says there is nothing to injure the forest but man. He will soon saw all that will pay, and roll the balance in heaps and burn it. Ten years hence there will be no timber worth anything in that locality.

A Chestnut Bluffs reporter says white oaks are dying from some species of insects.

A Cerro Gordo reporter says thousands of acres of hill lands there are profitable only for timber. More rigid laws are needed for the punishment of those who fire the woods.

A Colesburg reporter says the worst enemies the trees have are the poor land-owners, who have them chopped into wood, which they sell on the line of the railroad at $1.20 per cord.

A Dyersburg reporter says the greatest timber loss is in oak. Of the trunk, 10 to 15 feet is split out for wine-pipe staves, and the balance, 20 to 40 feet of good timber, is wasted.

A Flat Creek reporter says the worms first work in storm-blown timber and then take to the aged, standing trees.

A reporter from James County says one pine tree cut between May 20 and June 20 will perhaps kill 500 in the surrounding forest.

A Linden reporter says much valuable oak timber has been destroyed along the rivers where the lands are subject to overflow. This causes the tree to die, and insects then destroy it.

A Livingston reporter says that country abounds in the finest of timber, both hard and soft. It has inexhaustible quantities of coal, coal-oil, and iron ore. Storms damage timber a little.

A Medina reporter says once in a few years the young timber is damaged by caterpillars; probably one-half of one per cent. has been killed.

A reporter from Overton County says at the present rate of consumption all the poplar and walnut timber there will be used.

A Sunbright reporter says chestnut timber there is badly injured by "borers" or worms. The original cause is forest fires, which the natives have been in the habit of setting to make the range grow better and afford good hunting.

A White Bluff reporter says there are at least 50,000 cords of good wood rotting in the woods within two miles of that place. This is largely owing to the cutting of timber for hoop-poles and ax-helves, the bulk of the trees cut for helves being left to rot.

TEXAS.

Circular B was sent to 604 places; returns have been received from 98.

1. Nature of the business reported—whether saw, shingle, stave, or other mill or factory using timber or wood from the forest as first or stock material.

The reports show 81 saw-mills, 13 shingle-mills, 11 lath-mills, and 2 planing-mills.

4. What is the average number of logs required for making 1,000 feet of boards?

The report may be summarized as follows: Twenty-two returns give 5 logs; nineteen, 4 logs; nine, 3 logs; nine, 6 logs; eight, 10 logs; five, 7 logs; four, 2½ logs; four, 3½ logs; three, 4½ logs; two, 2 logs; one, 1 log; one, 5½ logs; and one, 8 logs.

5. What was the production of your mill or factory for the year 1882, and what is the estimated product for 1883?

A summary of the reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	161,207	182,683
Laths	do..	8,510	25,365
Shingles	do..	74,410	65,772
Staves	do..	.....	25
Other principal products:			
Pickets	do..	500	700
Pump stuff	do..	.....	300
Timbers for East Penitentiary, Rusk	do..	.....	300
Railroad ties	do..	.....	100
Market wood	cords	.....	10,000
Total		244,627	275,245

6. What suggestions can you offer, as the result of your observation or inquiries in regard to the origin and extent of forest fires, and as to their prevention and control? What can you say as to the maintenance of woodlands or other subjects of utility in reference to forest supplies?

A reporter from Atlantic, Cass County, says his observation is that young pine timber grows very rapidly after the grown timber is cut off—at least 10 per cent. faster.

A reporter from Big Sandy says the land in Texas being all under State control, he can see no way in which the General Government can take action, unless through the State authorities. Each year there is great destruction of timber.

A Clayton reporter says, inform the owners of timber of its value if you would preserve the forest supplies. Fires there usually originate from the carelessness of hunters or of those engaged in clearing ground.

A Cypress Top reporter says there is much timber cut on school and other public lands, and it is generally done at the time of year favorable to the development of the "pine sawyer," which insect prepares the timber to become a prey to fires.

A Dodge reporter says from there to the Sabine River is a world of the best pine in the United States—an area of 300 square miles.

A Harrisburg reporter says in long-leaf pine timber frequent fires are desirable, from the fact that but little fallen timber is consumed at a time, and little or no damage is done to timber.

A reporter from Harris County says they believe laws should be passed and strictly enforced in that country regulating the cutting of timber, as it is being rapidly destroyed by culling and cutting it over

regardless of system, and about as much is wasted as utilized. The forest question now is one of the most important for consideration.

A Houston reporter says forest fires are considerably caused by the carelessness of individuals not interested in lands. There should be action by legislative bodies to control such.

A Kildare reporter says timber is disappearing very fast. No trees of any value will grow on land there after the timber is cut.

A Maxwell reporter says fires are destructive in the mountains, and all the valuable timbered lands are being cleared up and settled.

A Marshall reporter says if they could prevent night hunting by the freedmen the forest fires would be less frequent.

A Minneola reporter says fires do not injure the timber in that section only as they impoverish the land. It is thus left dry and exposed to the summer heat.

A Montgomery County reporter says, keep the fires out of our forest and let the young timber alone, nature will do the rest.

An Orange reporter says the heat from forest fires causes the sap to flow to the heated parts, as oil flows to the wick in a lamp.

A reporter from Polk County says forest fires cause little damage in comparison with those occurring in the Northern States. The causes of fires here are principally carelessness and malice. This evil may be mitigated by the removal of trees unfitted for lumber, but this is almost impracticable.

A San Augustine reporter says woodland and timber there constitute nine-tenths of the area. The principal timber is the long-leaf yellow pine. Millions of feet of ash, hickory, and white oak are in the bayou bottoms.

A Sulphur Springs reporter says all the best timber in that section will be used up in a few years, for the best of it, now growing on our low lands, is being cleared off for farms, and no one seems to think of the future.

A Trinity reporter says fires in that section seem to be an advantage to the growth both of the timber and grass, for they destroy undergrowth that would otherwise destroy the range and limit the growth of larger timber.

7. In the cutting of timber for sawing or manufacture is there any limit of dimension regulating the matter? If so, mention the least diameter or girth that is allowable in cutting trees.

The reports received show eighteen of 10 inches; sixteen of 12; fifteen of no limit; eight of 14 inches; eight of 15 inches; seven of 16; three of 20; two of 8; one of 13, and one of 18 inches.

8. What kinds of timber are chiefly used in your business, and the relative amount of each?

Of the reports, 69 show pine; 29, oak; 10, walnut; 8, ash; 8, cypress; 8, hickory; 7, gum; 7, poplar; 6, elm; 3, cherry; 4, cottonwood; 2, magnolia; 2, pecan; and of birch, chestnut, hackberry, hemlock, linden, and willow, each 1.

9. MISCELLANEOUS REMARKS.

An Austin County reporter says, they have no young timber there. The lumber is imported from East Tennessee and Louisiana.

A Beaumont reporter says the forests of southeast Texas and western Louisiana are being cut into lumber very fast, and within the next twenty years, at the present rates of cutting, there will be but little pine timber left, but probably plenty of oak.

A reporter from Big Sandy says in seasons of drought the "borers," generally called "sawyers" by lumbermen, often attack the pine forests, generally the younger timber, destroy it entirely and clean as they go. In wet seasons they do not appear. All logs of *sap* timber are soon destroyed by them unless sawed up. They never do damage to what is known as *heart* pine.

A Burbank reporter says chestnut is largely worm eaten.

A Clayton reporter says the greatest damage at present is the breaking and otherwise injuring small timber by felling the large trees. The tops and other refuse parts, while decaying, doubtless superinduce innumerable insects, as well as tend to make the country unhealthy.

A Gladewater reporter says the borer is marching through a tract of six hundred and forty acres of his land in a swath well-defined, about 100 yards wide.

A Harrisburg reporter says, in portions of the pine district in that State a great deal of valuable timber is destroyed by high winds during very hot weather; the largest trees usually blow down. Worms work in the timber considerably and destroy large amounts annually.

A reporter from Harris County says laws should be passed encouraging the planting of timber as well as protecting the forest, forcing millmen and timber contractors to cut all the sawable timber and be required to fell it carefully.

A Houston reporter says during the summer season a small black bug, not quite as large as a grain of wheat, infests certain localities, where pine trees have been bruised, scalped, or cut; they bore them and lay an egg which soon becomes a worm. It has destroyed several acres in that vicinity. He suggests that when parties run out and survey lines they should not cut nor hack into the sap.

A reporter at Hughes Springs says in that belt of Texas, pine timber is being consumed very fast along the lines of the railroad; there is none nearer than two and one-half miles of the lines.

A Huntsville reporter says the hard wood in that section, after being chopped down early in the spring, is attacked by a small bug, and the "sawyer" bores into the heart of the pine, thereby ruining the sap portion.

A Jefferson reporter says the greatest injury done to timber in that section is by hurricanes, which tear up trees by their roots and thus prepare the way for the "sawyer."

A Minneola reporter says insects there do not injure one tree in a thousand. Pine timber is thrifty, and can be cut in from 10 to 15 years, when it is not too small.

An Orange reporter says worms go in patches all over the woods in from five to twenty-five acres, called "worm deadenings." There may be none of any consequence for several years.

A Peach Tree reporter says, in some places in that vicinity oak timber died during the past summer on account of drought. The forests are generally healthy.

A Polk County reporter says much of the long-leaf yellow pine in large trees is wind shaken. It has "junk knots." In some localities, about five per cent. of the forest has been destroyed by a recent storm. The timber is injured very much by worms.

A San Augustine reporter says occasional cyclones do the only principal damage in that latitude.

A Sulphur Springs reporter says all the best timber has been cut. Lately, fires have been rare, but there is little respect shown timber in that locality.

A White Bluff reporter says where farmers want to clear upland and are not near a mill, they destroy a great deal of timber to get it out of the way.

SUPPLEMENTARY REPORT.

The following supplementary report has been collated from additional replies to Circular "B," received after the original report had been prepared:

NORTH CAROLINA.

There are gleanings made from 34 reports received.

Q. 1. Thirty saw-mills, 5 shingle-mills, and 1 chair and furniture factory.

Q. 2 and 3 are answered under the head of Q. 5.

Q. 4. Seven reports give 4 logs; seven, 5 logs; five, 6 logs; and one each of 3, 4, 7, 8, and 20.

Q. 5.

The summary of reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	11,247	11,381
Laths	do..	489	708
Shingles	do..	780	1,604
Staves	do..	80	204
Shuttle-blocks	do..	100	50
Spokes	do..	75	38
Total		12,771	13,985

Q. 6. An Alleghany County reporter says they need a statute law to prevent useless destruction of timber.

A Caldwell County reporter says the fires generally set out by hunters and campers might be prevented by land-owners having their lands posted. The woodlands are almost boundless.

A Duplin County reporter says the forests should be burned over in the winter while the ground is damp and there is no sap in the trees.

An Oxford reporter says with the same waste in the next ten years as in the last, the timber of original growth will be cut off, owing to the tobacco raisers.

Q. 7. The reports show: no limit, 12; 12 inches, 3; 8 inches, 2; and one each of 7, 10, 11, 14, and 15 inches.

Q. 8. Twenty-two reports show pine; 12, oak; 11, poplar; 9, walnut; 6, ash; 4 maple, and cypress each; 3, cherry; 2, each of elm, hickory, and persimmon, and one each of beech, cedar, cottonwood, gum, and mahogany.

Q. 9. A Beaufort reporter says boxing for turpentine manufacturing causes the greatest injury there to timber.

A Caldwell County reporter says when pines are cut in the months of July and August from clusters, the surrounding black pines generally die.

SOUTH CAROLINA.

Reports are gathered from replies to 17 circulars.

Q. 1. Fifteen saw-mills.

Q. 4. Four reports give 2 logs; four, 7 logs, and there is one each of 3, 4, 6, and 10 logs.
Q. 5.

The summary of reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	10,990	12,267
Laths	do..	600	600
Staves	do..	50	20
Total		11,640	12,887

Q. 6. A reporter from Gilbert Hollow says they now have a stock law in that State, and forests fires will now measurably stop.
A Williston reporter says the forests should be burned over from December to February 1.
Q. 7. No limit, 11; 10 inches, 2; 8 inches, 2; 6 and 5 inches, each 1.
Q. 8. Pine, 15; oak, 7; poplar, 4; ash, 3; elm and hickory each 2, and walnut 1.
Q. 9. An Easley correspondent says oak timber dies each year because of hot, dry weather.
A Horry County correspondent says the turpentine workers destroy more timber in one year than the mills do in five or six.

GEORGIA.

Nine reports are summarized for the Empire State of the Gulf range.
Q. 1. Eight saw-mills and one shingle-mill.
Q. 4. Four reports give 4 logs and 5 logs.
Q. 5.

The summary of reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	3,220	3,920
Laths	do..	245	250
Shingles	do..	100	200
Total		3,565	4,370

Q. 6. A reporter from Saint Mary's says it should be made a crime to set fire and let it go; it is so destructive to the young growth.
Q. 7. No limit, three; 10 inches, three; 8 inches, two; 12 inches, one.
Q. 8. Pine, 6; oak, 5; poplar, 4; ash, elm, and gum, each 2; and cedar, cypress, and maple, each 1.
Q. 9. A reporter from Talbotton says the turpentine interest, which has been so largely increased in Georgia since its decline or partial exhaustion in the Carolinas, causes more injury to forests than anything else.

FLORIDA.

There were five supplementary reports from this State.
Q. 1. Three saw-mills are reported.
Q. 4. Two reports give 6 logs, and one, 5.
Q. 5.

The summary of reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	2,330	2,840
Laths	do.	5,000	7,500
Shingles	do.	.....	8,000
Total		7,330	18,350

Q. 6. A reporter from Altamonte says: Forest fires in that State are usually set by persons who have a few cattle to graze on their neighbors' land, which do more damage to property than the value of stock cattle. They can be prevented by Congress passing a universal law to hang those who set them. Give the people license to lynch, and they will send you some samples soon.

Q. 7. No limit, 2; 8 inches, one; 12 inches, one.

Q. 8. Pine, 5; cypress, hickory, oak, poplar, and gum, 1 each.

Q. 9. A reporter from Eau Gallie says: A more thorough drainage of the country would greatly increase the growth of forest trees, especially oak and pine.

ALABAMA.

This report covers three circulars.

Q. 1. Three saw-mills and one planing-mill.

Q. 4. Two reports, 6 logs; one report, 2 logs.

Q. 5. Boards and other sawn lumber: 1882, 510 M.; 1883, 450 M.

Q. 6. A Pike County reporter says: State legislatures should be induced to pass an act upon the matter of cattlemen setting fire to the timber. It is a serious injury to land and forest.

Q. 7. Two reports give ten inches.

Q. 8. Pine, 3; oak, 2, and hickory and poplar, each 1.

Q. 9. A reporter from Crenshaw County says timber is largely cut there every year to make way for cotton-planting.

MISSISSIPPI.

Ten reports are summarized.

Q. 1. Nine saw-mills and one shingle-mill.

Q. 4. Three reports give 5 logs, and one each of 2, 3, $3\frac{1}{2}$, and 4 logs.

Q. 5.

The summary of reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	15,825	15,254
Laths	do..	500	600
Shingles	do..	300	4,100
Total		16,625	19,954

Q. 6. A Panola County reporter says no one should be allowed to build a fire by the side of a tree or stick an ax into the same unless for the purpose of using it.

Q. 7. No limit, one; 10, 12, 15, and 18 inches, each two.

Q. 8. Cypress, pine, and oak, each, 4; gum and poplar, each, 1.

Q. 9. A Caswell reporter says worms occasionally kill pine, but not

materially. Washing from the uplands and overflows occasionally kill out the white-oak timber in the creek and river bottoms.

LOUISIANA.

The following is shown from the two supplementary reports received from this State:

Q. 1. Two saw-mills.

Q. 4. Three logs; four logs.

Q. 5. Boards and other sawn lumber: 1882, 1,348 M.; 1883, 1,265 M.

Q. 7. Ten inches; 12 inches.

Q. 8. Cypress, 2; pine, 2.

TEXAS.

Twenty-five reports have been summarized from the supplementary returns from this State.

Q. 1. Twenty saw-mills.

Q. 4. Three reports show 4, 5, and 6 logs each; two, 7 and 8 each; three ½, 5½, 10, and 12, one each.

Q. 5.

The summary of reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	27,802	21,324
Laths	do..	1,212	175
Shingles	do..	14,022	7,510
Total		43,036	29,009

Q. 7. No limit, 7; twelve inches, 4; eight, 10; eighteen inches, each, 2; six and fourteen inches, each, 1.

Q. 8. Pine, 13; oak, 12; ash, 5; elm, 3; cottonwood, pecan, and walnut, each, 2; cedar, cypress, hickory, magnolia, and mulberry, each, 1.

TENNESSEE.

There are thirty-one supplementary statements returned from this State.

Q. 1. Twenty-seven saw-mills and 1 shingle-mill.

Q. 4. Eight reports show 3 logs; five, 5 logs; four, 4 logs; three, 2 logs; one each of 2½, 7, and 10.

Q. 5.

The summary of reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	12,258	12,709
Laths	do..	330	412
Shingles	do..	275	400
Staves	do..	75	160
Total		13,438	13,672

Q. 6. A reporter from Bradley County says the careless cutting of timber in the summer season causes great damage to young timber.

A Cane Bridge reporter says burning in the spring for grazing purposes keeps all the small growth killed out.

A Clay County reporter says the worst destruction to our timber is caused by storms.

A reporter from Cocke County says the forest fires generally originate with a worthless population who occupy the mountain ranges and start the fires through pure meanness. They should be prevented by a most stringent law. The fires should be controlled by requiring every citizen in the district to turn out and stop them.

A reporter from Reelfoot says forest fires are mostly occasioned by the carelessness of hunting parties at night or by some mischievous persons. The law should be enforced in every case where its infraction can be proven.

Q. 7. No limit, 12; twelve inches, 4; ten inches, 2; eighteen inches, 2; twenty inches, 2; twenty-four inches, 2.

Q. 8. Poplar, 17; pine, 10; ash, 9; walnut, 8; oak, 13; chestnut and cypress, each 3; gum and linden, each 2; cherry, cottonwood, and elm, each 1.

Q. 9. A Hancock County correspondent says 100,000 feet annually of timber are destroyed there by fire and insects.

A Cocke County reporter says the Government should without delay enact and enforce such laws as would stop these fires.

KENTUCKY.

Abstracts are made from the returns of 14 circulars.

Q. 1. Thirteen saw-mills.

Q. 4. Seven reports show 3 logs, and three show 4 and 5 logs each.

Q. 5.

The summary of reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	7,020	7,175
Lathe	do..	2,950	3,120
Shingles	do..	2,000	3,000
Staves	do..	1,350	600
Ax-helves	M..	300	400
Total	do..	13,620	14,295

Q. 6. A reporter from Moscow says timber is being very rapidly destroyed in that section.

Q. 7. No limit, 4; ten inches, 3; one each of 12, 15, and 20 inches.

Q. 8. Poplar, 12; oak, 8; ash, gum, and walnut, each 3; hickory, 2; beech, cherry, chestnut, cypress, and linden, each 1.

Q. 9. An Albany reporter says the forest is rapidly disappearing there, and no regard is taken for future supply.

A reporter from Montgomery County says the wood-sawyer does great damage in this section.

MISSOURI.

Supplementary returns have been received from thirty-one circulars.

Q. 1. Twenty-seven saw-mills.

Q. 4. Ten reports show 4 logs; six, 3 logs; three, 6 logs; three, 10 logs; two, 6½ logs; and one, 11 logs.

Q. 5.

The summary of reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	16,311	16,459
Laths	do..	1,000	25
Shingles	do..	1,095	150
Gun-stocks	do..	100	120
Chair stuff	do..	50	60
Total		18,556	16,814

Q. 6. A reporter from the counties of Reynolds and Wayne says there is no young pine timber growing in Southeast Missouri, from the fact that the pineries are burnt over, and in a few years pine lumber will be scarce in that section.

Q. 7. No limit, 10; ten inches, 10; twelve inches, 2; one each of 6, 8, 14, 15, 17, and 18 inches.

Q. 8. Pine, 7; elm, 7; oak, 16; ash, 8; walnut, 7; hickory, 6; sycamore, 5; gum, 3; maple, 2; cottonwood, 6; cherry, 2; birch, 2; hackberry, linden, and poplar, each 1.

Q. 9. A Boonsborough reporter says worms get into the timber and much is killed.

A reporter from Barry County says two-legged insects of the masculine gender are very destructive and troublesome customers; they set out so many fires in the spring of the year.

A reporter from Bollinger County says they suffer from a whitish-brown insect, with a big body, a large head, and small in the middle, that works in the scrubby black oaks on the hills.

A reporter from Lamar says a large grub or wood worm greatly damages burr and black oak. The timber is also damaged by heavy winds.

A King City reporter says the white hickory seems to be the native home of the borer. The young hickory and some kinds of oak are frequently destroyed by them.

KANSAS.

One report comes from Holton, Jackson County, summarized as follows:

Q. 1. One saw-mill.

Q. 4. About 6. Boards and other sawn lumber, 1883, 30 M.

Q. 8. Cottonwood, elm, linden, oak, walnut, and sycamore.

Q. 9. Cutting all the old and large timber induces more general and uniform growth.

NEW MEXICO.

Four reports are summarized as follows:

Q. 1. Three shingle-mills and 3 saw-mills.

Q. 4. Three, 4, and 7 logs.

Q. 5.

The summary of reports is as follows:

Products.		1882.	1883.
Boards and other sawn lumber	M..	490	450
Shingles	number.	1,335	1,100
Total		1,825	1,550

Q. 6. A reporter from Elizabethtown says keep the Indians on their reservations and there will be no forest fires in that section. The railroad and other companies should not be permitted to destroy the public timber.

Q. 7. Ten inches and 15 inches.

Q. 8. Pitch, spruce, white and yellow varieties of pine.

Q. 8. An Elizabethtown reporter says the Government land grants here claim nearly 3,000,000 acres. At the head of some of the cañons there are nearly as many trees lying on the ground as growing. The cause of their dying is not well known.

A Las Vegas reporter says injuries to trees there arise from the heat of the sun, and those on the south side of the hill are nearly all damaged at the heart.

A Park View reporter says about one-half of the trees there are rotten at the heart. The forest is too old, and the smaller trees are scrubby like, and really of but very little value.

REPORTS ON THE FOREST CONDITION AND LUMBER AND WOOD TRADE OF WESTERN STATES AND TERRITORIES.

By R. W. FURNAS, *Agent of the Department.*

The following is submitted as work performed under special instructions "to visit the Pacific coast and make investigations in California, Nevada, Oregon, and Washington Territory." Time and means being limited, the investigations were confined to portions only of California, Oregon, and Washington west of the Cascades, obtaining incidentally such other additional reliable data from other portions of territory indicated as circumstances would permit.

The whole territory designated, in its relation to forestry, is important, and should have careful and detailed investigation and full report. For such purpose, economy and wisdom on the part of Congress should provide such appropriations, from time to time, as will enable the Agricultural Department, in the discharge of duty, to obtain and furnish the country with all information possible.

The varieties of timber, the purposes for which such are used, and in fact nearly all the surrounding and attending characteristics of the comparatively small area now reported upon are so nearly the same, that, for brevity, they are treated, so far as is practicable, as one and the same.

VARIETIES OF TIMBER.

The following list of varieties embraces those of arboreous character, and commercial value and importance, found in California, Oregon, and Washington Territory. I am indebted to Prof. G. H. Collier for valuable aid in completing this list. Many measurements were made in person.

PINES.

SUGAR PINE, *Pinus Lambertiana;* COMMON PINE, *Pinus ponderosa;* SILVER PINE, *Pinus monticola;* BLACK or JACK PINE, *Pinus contorta;* also two smaller varieties, *tuberculata* and *albicaulis.*

The sugar pine grows to a height of 250 feet, with a diameter from 8 to 10 feet; common pine, 170 or 180 feet high, and from 4 to 5 feet in diameter; silver pine, 150 to 160 feet high, and 3 to 4 feet diameter; black, *albicaulis*, and *tuberculata*, from 50 to 70 feet high, and 1 to 3 feet in diameter.

FIRS.

WHITE FIR, *Abies grandis;* NOBLE FIR, *Abies nobilis;* LOVELY FIR, *Abies amabilis;* YELLOW FIR, *Abies (pseudotsuga) Douglasii.*

The *concolor* is frequently called white fir.

The *subalpina* is found on the higher elevations, growing to a height of 50 and 60 feet, and from 1 to 2 feet in diameter.

The white and yellow firs are the most abundant and of most commercial importance. The yellow fir reaches to over 300 feet in height,

with a diameter of 12 feet. White fir to near 200 feet in height and 5 and 6 feet in diameter. Noble fir attains about the same in dimensions as white. Lovely fir, less pretentious, contents itself with a slight advance beyond 100 feet in height and 2 to 3 feet in diameter.

Tide-water spruce—*Abies (picea) stichensis*—known also on the coast as *Menziesii*, grows to 200 feet in height, with a diameter of 8 to 10 feet.

HEMLOCKS.

HEMLOCK, *Abies (Tsuga) Mertensiana;* MOUNTAIN HEMLOCK, *Abies (Tsuga) Pattoniana;* ENGELMAN SPRUCE, *Abies (picea) Engelmanni.*

The mountain hemlock grows 100 feet in height, with a diameter of 4 to 5 feet. The *Mertensiana* exceeds it in height 50 or more feet, with about the same diameter. The *Engelmanni* reaches 50 feet in height, with a diameter of 12 to 18 inches.

TAMARACK.

TAMARACK, *Larix occidentalis;* LARCH, *Larix Lyallii.*

The tamarack reaches 150 to 160 feet, measuring 4 to 5 feet in diameter. The larch is small.

CEDARS.

THIN-BARKED CEDAR, *Thuya gigantea;* THICK-BARKED CEDAR, *Libocedrus decurrens;* PORT ORFORD CEDAR, *Cupressus (Chamæcyparis) Lawsoniana.*

The thin-barked cedar is the more common and abundant of the mills, and grows to a height of nearly 200 feet, with an average diameter of 5 and 6 feet. From the ground up, for 4 or 5 feet, it often shows a stump diameter of 12 and 15 feet. Thick-barked cedar ranges to 100 feet in height, and from 4 to 5 feet in diameter. Port Orford cedar is very valuable and of limited habitat. Thus far it is only found in Coos County, Oregon, as I am informed. The wood is noted for durability, and characterized by an exceedingly pleasant and perpetual odor, and is perfect proof against moths and other obnoxious house insects. As such it is used in the manufacture of chamber furniture, wardrobes, &c. The wood is of white color. The tree grows to a height of over 200 feet, with a diameter of 6 or 7 feet. The lumber is worth $60 per thousand at the mills at Portland and on Puget Sound.

Professor Collier found Sitka cedar, *Cypressus (Chamæcyparis) Nutkaensis*, in limited growth at the base of Mount Hood. This, too, is rare and valuable. It will be remembered that Mr. Seward brought this variety of cedar home with him from Alaska, and had it worked into his library furniture.

JUNIPER, *Juniperus occidentalis;* YEW, *Taxus brevifolia.*

OAKS.

LIME OAK, *Quercus chrysolepis;* WHITE OAK, *Quercus Garryana;* BLACK OAK, *Quercus Kelloggii;* CHINQUAPIN OAK, *Castanopsis chrysophylla.*

Oaks of the Pacific Slope will not compare favorably in value with those of other portions of the United States. The wood is brittle and not of so close grain. Trees grow spreading and of comparatively low stature, rarely reaching from 50 to 70 feet, and short bodied. They are used almost exclusively for fuel.

ALDER.

ALDER, *Alnus rhombifolia.*

This tree is quite abundant, growing from 80 to 90 feet in height, with a diameter of 2 to 3½ feet. The lumber is soft and light, very much resembling the linden, so abundant in many of the Eastern and Middle States. It is used extensively in inside work in the manufacture of furniture.

OREGON ASH.

OREGON ASH, *Fraxinus Oregana.*

This is a strong, valuable variety of timber, found abundantly in Oregon and Washington Territory. It grows from 60 to 80 feet in height and 2 to 3 feet in diameter.

LARGE-LEAVED MAPLE.

LARGE-LEAVED MAPLE, *Acer macrophyllum.*

This is found in abundance and used for many purposes. The lumber made from it is valuable. Some extraordinary fine "bird's-eye" and "curled" are used for veneers. It is utilized in all the towns and cities for shade and ornamental purposes. The leaf is a large, deep green, nearly a fac-simile in appearance and shape of the hard maple, making it highly valuable for the latter-named uses.

MADRONA.

MADRONA, *Arbutus Menziesii.*

This is a beautiful hard-wood tree, taking a fine polish, and growing from 50 to 60 feet in height and 3 to 4 feet in diameter.

A variety of cottonwood grows abundantly along the banks of the Columbia and Willamette Rivers. The botanical name is not learned. It grows to good size, is worked up at the mills, and considered of value for many uses, notwithstanding so many really more valuable varieties of timber are found in greater abundance.

Several valuable varieties of willows are found in all parts of the territory embraced in the report; also, mountain mahogany, wild cherry, manzinita, chittim wood, choke cherry, quaking ash, dogwood, mountain ash, black haw, and service berry were observed.

REDWOOD.

REDWOOD, *Sequoia sempervirens.*

While peculiar to the Pacific Slope, in fact almost exclusively so to California, the characteristics of this tree are too well known to require extended notice.

The *Sequoia*, or redwood, is the prevailing commercial timber of California and Southwestern Oregon, and is of great value. The important consideration is its present supply, rate of consumption, and probabilities of reproduction. It has existed in the mountain valleys and cañons of the coast and Sierra Madre Ranges in immense quantities. There is yet a large supply, but it is being rapidly consumed, and with little regard for economy or saving where obtained and cut.

No exact data can be had as to acres of timber of any kind, or varieties used. The trade is conducted under the general term "lumber," with but little, if any, further distinction. After personal visits to lumber yards, and conferences with dealers, it is safe to record a very large preponderance of redwood lumber made and used in California. In round numbers, including lumber, railroad ties, posts, shingles, laths, and shakes, it is estimated 2,500,000,000 feet were consumed and handled in San Francisco during the year 1882. This supply was not all obtained in California; portions came from Oregon and Washington Territory.

There had been shipped to Los Angeles from January, 1883, to June of the same year, some 85,000,000 feet. The sources from which this supply was obtained were about the same as at San Francisco.

Parties who prepared and reported statistics from California for the Census Office in 1880 estimated the redwood standing in forest then at 25,825,000,000 feet, board measure, and the cut of the same year at 186,635,000 feet. The same parties and experts, having knowledge of conditions, estimate the standing supply of 1880, reduced by the cuts of 1881-'82, to about 20,000,000,000 feet in round numbers. Some new discoveries of supplies have been made, which are supposed to equal the cuts of 1881-'82.

The redwood timber yield per acre is so much larger than that of any other variety, or of any other portion of country, as to seem fabulous. In the Russian River redwood groves—Hulburt Cañon—numbers of trees were personally measured. One girthed 60 feet, 5 feet above ground. One felled tree measured 367 feet from ground to topmost extremity. Others standing were estimated by loggers to be over 400 feet high. In many portions of this forest the interior was so dense that trees could not be felled to the ground. Cutting and felling is done from the outer borders of groves. A reliable mill-owner at Guerneysville informed me that one of these large redwood trees had been worked up to a maximum of 240,000 feet of lumber, including all purposes for which its various parts could be used. Bayard Taylor, it will be remembered, reported one of the "Big Trees" as yielding 250,000 feet of lumber.

In summing up the total lumber trade, it is meant to include lumber proper, laths, staves, headings, wood, &c., reduced to board measure.

While, as yet, but little attention is given to the reproduction of this timber, it is believed, by those who have given thought to the subject, it can be reproduced as readily as other varieties. Passing through portions of forests from which all the original growth had been cut, all visible indications were favorable. Where undisturbed, and fire kept out, young growth was abundant, and of rapid development. Some experiments on a small scale have been made, by growing seedlings in nurseries. But, as a rule, the same old condition of affairs seems to prevail, where this timber grows naturally and in abundance, as in other timbered regions—the value is not appreciated and realized until nature's supply becomes entirely exhausted.

EUCALYPTUS.

The introduction of the Australian gum tree—*Eucalyptus*—into California and other portions of the United States, where climate permits, has given so much satisfaction and been fraught with such beneficial results that prominence is here given the subject, indulging and expressing the belief that the future will more than fulfill the most san-

guine expectations or predictions. Its introduction is of comparatively modern date. The more it is seen and known, the more it grows in popular esteem. When in Southern California two years since, the writer became interested in observations then being made, and he now investigates the subject with renewed interest.

The *Eucalyptus* was originally introduced for both sanitary and ornamental uses, and later for fuel. It is sometimes called the "Fever tree," because it is credited with properties preventing malarial fevers, and has "disinfectant" virtues. It is also an antiseptic for wounds, its essential oil being a stimulant, and the tannin in the leaves, acting as a tonic astringent, applied exteriorly, hastens healing of wounds. Chemists enumerate its uses as "infusion, decoction, powder, distilled water, tincture, extract, and essence." It is as rapid in growth as the cottonwoods of the Missouri Valley, and yet is of the "hardwoods." The wood combines density of texture with rapidity of growth. A singular characteristic is that, growing isolated, it reaches upward astonishingly and does not branch out laterally as do nearly all other trees under similar circumstances. It is as durable for underground uses, and railroad ties, as oak, the wood being compact and tenacious, and, owing to the presence of resinous matter, possesses unusual incorruptibility, which allows it to remain in contact with salt water to advantage. Keels of the best South American whale ships are made from the variety *Eucalyptus globulus*. The English navy value it for solidity, tenacity, and durability. In its native habitat it grows to enormous size, excelled only by the California "Big Trees," *Sequoia gigantea*. Baron Ferd. Von Mueller reports a plank on exhibition at the London Exposition in 1862 as 10 feet in width and 75 feet long. Australia desired to send a plank 175 feet long but no ship could be found to transport it.

Ellwood Cooper, of Santa Barbara, Cal., has given much attention to the cultivation of this tree. He reports thirty-one varieties introduced, and has a plantation of over fifty thousand trees, growing in forest form. His experience shows "a growth in three years, from a seedling transplanted, of 9½ inches in diameter, and 42½ feet high. At this rate sixty years would give a tree 16 feet in diameter."

It grows without irrigation on the highest, driest arid soils of Southern California. Particularly from Los Angeles to San Diego, and intermediate sections, much attention is given its cultivation. It has been introducted with success in Algeria. M. Trottier, a colonist and planter there, estimates the "profits of one thousand trees, of five years old, at $240, and of twenty-five years at over $10,000. By actual measurement, the annual growth was found to be 4½ inches in circumference, and the growth in height an average of 19 inches per month. A yearling seedling planted out in May measured 19 feet high the following December. At the age of fifteen years the tree measured over 70 feet in height."

It is excellent for fuel, but must be cut, split, and worked up while green. When dry and well seasoned, it is said to split crosswise about as well as lengthwise with the grain.

The editor of *Rural California*, George Rice, Esq., of Los Angeles, who is doing much to encourage the cultivation of the *Eucalyptus*, gives strong facts, and reasons therefor, when he says:

Even now fire-wood is hauled 35 miles to Los Angeles, and good stovewood is worth from $12 to $14 per cord (short cords at that); but, although the cost of fuel is a heavy tax at present, the steady diminution of the stock is ominous for the future, and prices must continue to increase; as the supply near at hand is exhausted, and

as the hauling distance increases, the price of wood must increase in proportion. In our article on arboriculture in the March number, we advocated the planting of forests of blue-gum trees for fuel, and at the present outlook this seems to be the only remedy for a fuel famine in the future. This matter is so important, and our need so pressing, that we deem it of sufficient importance to keep the subject constantly before the public. These fuel forests are the very best and most certain investments that capital can be put into in this section.

The farmer, the winemaker, and the fruit culturist have to seek a market for their products at a distance, where they come in competition with similar products from other localities, and they are liable to losses from insect pests, frosts, droughts, and a variety of other causes, which make results somewhat uncertain. But a blue-gum plantation, on properly-selected soil, well cared for for two years, will take care of itself, and in eight or ten years bring to its owner a certain result, in the way of income, yearly. From that time into the indefinite future, the tree reproduces itself from the stump, and the root that produced one tree a foot in diameter in ten years will produce two of equal size in the next ten years. The second crop will then be double in value to the first, and, as the root lives, there seems to be no limit to the life and continued reproduction.

"When the trees have grown to be large enough to be cut for fuel, the owner will commence by cutting off one-eighth or tenth of his grove, and on each succeeding year the same quantity, until he has gone entirely over the ground, when the part where he first commenced will be ready for him to commence again, and so on indefinitely at an increasing ratio; the larger and stronger the roots become, the more timber they will produce, and all the care and attention the forest will require will be to confine the number of sprouts on the stumps of the previous year's clearing to two, the expense of which will be small. The main expense will be cutting and hauling to market. He will have the advantage of a home market, and no outside competition, as the article will not stand transportation from a distance. People must have fuel, and the large population which live in the valley will necessarily consume large quantities of fuel, and it has got to be raised. Mr. Madeau is now cutting his five-year old blue gums, which yield 25 cords of good hard wood per acre, worth $10 per cord on the ground, or $250 per acre. This is $50 per year for the land. In the next five years the stumps from these trees will produce trees that will yield at least 50 per cent. more wood, or 37½ cords, worth $375 per acre; or if permitted to grow for ten years, $750, and no care or expense to the owner, except thinning out the suckers, the year after cutting. The total cost of the land, planting and cultivation, need not be over $100 per acre, and after the trees are large enough to cut, the harvest is annual and the income perpetual. There is no possible chance to lose money. Select the right kind of land, cultivate and plant it properly, and a man can provide an income for his children which will not fail."

This is simply a statement of well-known facts. There are several small blue gum plantations scattered about the valley that have in every instance proved a success when planted on the proper kind of land and having the requisite attention at the start. There have been failures; one plantation was made on ground supersaturated with alkali at a depth of 4 or 5 feet; the trees grew well until the roots reached the alkali, when they died incontinently. The other failure was caused by the trees being planted on good land that had not been loosened or mellowed by previous cultivation, and received no care afterwards. Most of the trees died, and those that lived have made but a stunted growth. These are the only complete failures known—all other instances have been complete or partial successes; one of the latter shows the vigor and hardiness of the tree. Twenty acres were planted near Anaheim, 14 acres being good soil, and 6 acres on a ridge of loose subsoil. The 14 acres proved a failure, while the trees on the worthless 6 acres are large and handsome. This land (the 6 acres) was almost worthless for agricultural purposes, but it suited the blue gums.

WASHINGTON TERRITORY.

The most important portion investigated was that of Washington Territory, contained in the area north of the Columbia, bounded on the east by the Cascade range of mountains, on the north by British Colum-

bia and the Strait of Fuca, and on the west by the Pacific Ocean, containing in round numbers about 30,000 square miles. The principal portion of this region is covered with a dense growth of timber trees, of which the most abundant and most important, being used almost exclusively in the manufacture of lumber, are the firs (*Abies Douglasii* and *Abies grandis*). The other kinds of coniferæ found at the mills are the cedar (*Thuya gigantea*), the spruce (*Abies Menziesii*), and hemlock (*Abies Mertensiana*). A species of white pine (*Pinus alba*) is occasionally found. The yellow pine (*Pinus ponderosa*) which grows to majestic proportions in the eastern portion of Washington Territory is not found on Puget Sound. The other cone-bearing tree is the arbor-vitæ (*Thuya pilitica*), which grows along the Strait of Fuca. Full 90 per cent. of all the lumber, timber, and spars produced on Puget Sound is fir, and is so known and classed by all lumber dealers and millmen.

Of the deciduous trees the most common is the white maple (*Acer alba*), a beautiful wood capable of high polish, and the alder (*Alnus Oregana*). The wood, being white and soft, is good for carving and for furniture, the bark furnishing a red dye, used by the Indians for coloring. The white ash (*Fraxinus Oregana*) is larger than the ash of the Atlantic States, and is light and elastic. The laurel (*Arbutus Menziesii*) extends from California to Vancouver's Island, and is common on the immediate shores of Puget Sound, Fuca Strait, and the western coast. Three species of poplar are found; the most abundant is the aspen (*Populus tremulus*). Several varieties of the willow grow along the river banks; only two (*Salix speciosa* and *Salix flavescens, scouleriana*) attain the size of trees.

The first saw-mill in Washington Territory was erected in 1845, at Tumwater, near Olympia, by Colonel Simmons. The falls of the Deschutes River, at Tumwater, furnish fine and very extensive water power, but for some reason it is only partially utilized at present.

The first shipment of sawed lumber from Puget Sound was in the fall of 1851, from McAllister's Creek, a mill erected that year by a gentleman of that name. The first steam saw-mill was put up at Seattle in 1853. At present, the following mills are operating on the sound, with a daily capacity as indicated:

	Feet.
Port Gamble	150,000
Port Ludlow	150,000
Utsalady	75,000
Port Madison	92,000
Port Blakely	150,000
Tacoma (Old)	150,000
Seabeck	65,000
Milton	30,000
Port Discovery	60,000
New Tacoma	15,000
Stetson and Post, at Seattle	20,000
Colman's, at Seattle	30,000
Whatcom	15,000

The demand for lumber is so great these mills are run at their full capacity. Doubtless there are others, the data of which were not obtained.

The primitive methods of logging, handling, and sawing timber into various merchantable products, have all been superseded by modern improvements.

The finest timber region of Washington Territory may, with propriety, be termed as unexplored. It lies west of the Willamette meridian, commencing at a point opposite Portland, Oreg., and running due north to Port Townsend. Between this meridian and the Pacific

Ocean is an area composed of the Olympic range, as large as all the New England States, densely covered with the most magnificent growth of stately firs that can be found on the American Continent. For information relative to this region, the writer is indebted to Mr. L. Samuel, editor of the *West Shore*, who has, in person, visited it in detail.

This vast timber tract is distinct from the forests on the eastern side of Puget Sound, where many million feet of timber are annually taken from the dense growth of gigantic firs which line the banks of the Samish, Skagit, Snohomish, Snoqualmie, Dawamish, White, Nesqually, and Puyallup Rivers, and extend eastward to the snow line of the Cascade Mountains. All the rivers named are capable of floating millions of logs to the waters of Puget Sound, and loggers are actively at work on most of them at the present time. The product is towed by tug boats in booms of logs to the various mills.

As the value of logs is constantly augmenting and the demand for lumber continually increasing, and when railroads to the interior are constantly adding new markets to the present great foreign demand, the question naturally arises, in view of these enormous requisitions upon the timber resources of Puget Sound, how long will it take to exhaust the stock of marketable timber? The vast pine forests of Maine have been shorn of their strength, and whole districts of the finest pine lands of Michigan and other Western States entirely cleared of their timber. In almost every instance where the pine has been cut the succeeding growth is of deciduous trees. In fact, the great lumbermen of the States east of the Rocky Mountains have already turned their attention to the forests of Western Washington Territory, and pronounce them to be the source from whence, in the near future, the world must derive its supply of fir timber, as well as other coniferous woods. This question has already attracted the attention of careful observers, and it has been computed that perhaps a hundred years will not elapse before the present growth shall have been cleared by the woodman's ax, even allowing a new growth to occur.

Bold writers assert the belief that the supply of fir in Washington Territory can never be exhausted. Personal observation warrants the assertion that destruction of timber by fire has never been greater anywhere than in Washington Territory, especially along the Sound. It is simply fearful, criminal! It is admitted that, with the natural peculiar reproductive characteristics of the fir region of this country, if forest fires can be successfully guarded against, generations to come will not live to see the supply exhausted. The new growth springing up where the land has been denuded either by fire or ax is wonderful; thicker, seemingly, than the original. But it must be remembered that from a half to a whole century is required for this class of timber to reach full size, and perhaps as many more years to ripen fit for use. Replanting or reproducing timber is estimated to be in proportion of one-thirty-fifth to that of destruction. This may be considered applicable everywhere.

The General Government is doing all that is possible in the way of enactments and providing special agents to protect, in various ways, the vast timber domain of the North Pacific Slope. Local authorities are assisting in these efforts. The North Pacific Railroad Company, through its efficient land commissioner, Mr. Paul Schutze, is indefatigable in co-operative work. He has printed on cloth the gist of the United States law relative to timber depredations, either by fire or otherwise, together with special instructions to agents, and caused them to be posted on highways and through timber lands. Railroad engines are

provided with spark-arresters to prevent accidental fires from that source.

Mere statutory provisions, either national or local, enacted to protect the timber domain, or encourage timber growing in naturally treeless or denuded regions, while beneficial, so far as they go, regarded as moves in the right direction, are next to infinitesimal in themselves. Public opinion and interest must be awakened and educated up to a sustaining and enforcing point. This is the important desideratum. How and in what manner this can be most speedily and successfully accomplished is yet an open question.

Facts have long since made manifest to the observing student that the increased demand for, and rapid consumption of, the timber of the country, together with its wanton waste and useless destruction, is rushing us to the verge of timber famine. While most writers, even from a non-producing standpoint, bring the famine date closer than facts warrant, it is sufficiently near to disturb the most careful and reliable calculations.

LUMBER STATISTICS.

Actual or even reliable data concerning timber standing in forests fit for the saw, in California, Oregon, and Washington Territory, were not obtainable during the brief investigation. In fact it is doubtful if more than a very unsatisfactory approximate estimate can be made. It is hoped the facts presented will be sufficiently important to the Department to lead to more detailed efforts in future.

The following are the leading facts in the timber trade of that portion of the Pacific Slope included in this partial report of district assigned. Statistics were obtained from parties and sources considered reliable, and are as full as can, perhaps, be made. Railroad ties, telegraph poles, fuel, and other items for which timber is used, are not included. The product of the year 1882 is presented:

CALIFORNIA.

Sawed lumber proper	feet	629,435,000
Shingles	number	363,139,000
Shakes, or staves	do	4,135,000
Laths	do	4,631,000

OREGON.

Sawed lumber proper	feet	245,252,000
Shingles	number	10,590,000
Laths	do	25,371,000
Staves	do	2,125,000

WASHINGTON TERRITORY.

Sawed lumber proper	feet	602,624,000
Shingles	number	20,830,000
Staves	do	45,434,000
Laths	do	55,326,000

Nine-tenths of the above, it may be safely said, is from what is familiarly known as the Puget Sound region.

At present comparatively little of this product finds its way to the Eastern States. The Northern Pacific Railway, soon to be completed, and other railroad lines reaching to various points on the Pacific Slope, will afford mediums of exchange and enable these great timber supplies to be more largely distributed than heretofore.

Extensive shipments of timber and lumber are made by sea to foreign countries. The largest-sized vessels entering through the Strait Juan de Fuca can traverse the Sound waters at all stages to within a few miles of Olympia, the southernmost point, and to the docks at high tide.

REPORT ON THE FOREST CONDITION AND LUMBER AND WOOD TRADE OF WESTERN STATES AND TERRITORIES.

By R. W. Furnas, *Agent of the Department.*

DAKOTA.

Eighty-three circulars were sent out, to which sixty-five replies have been received.

AURORA COUNTY.

There was originally in this county a very limited area of scrubby burr and jack oak, and green ash in protected places. The fires sweeping annually over well nigh the whole surface of country had dwarfed all timber-growth not entirely destroyed. Most of the natural growth was consumed for fuel. Where fires have been kept in subjection along streams, ravines, and rough lands, there is an encouraging spontaneous growth. There has been much timber planted under the timber-culture act, and, in addition, nearly all farmers plant more or less of small groves; also wind-breaks. A correspondent says: "Successful tree-growing here is an established fact." Cottonwood is most extensively planted. Catalpa, honey locust, white ash, box-elder, soft maple, Lombardy poplar, and gray willow are planted quite extensively, and do well where land is carefully prepared and planting cared for until trees are large enough to shade the ground. An insect resembling somewhat the Colorado potato-beetle has injured cottonwoods in some localities. It breeds on the common wild sun-flower, and feeds there until the food supply is exhausted, and then attacks the cottonwoods.

BEADLE COUNTY.

The following interesting paragraph is copied from a response by R. H. Lee, of Altoona, Beadle County:

> Beadle and Spink Counties have no timber except along "Jim" or Dakota River, and that very scattering—cottonwood and box-elder only, but of fair quality. We find here, scattered on the surface of the prairie, and buried from 2 to 10 feet, many specimens of petrified wood. Some very large pieces have been dug up, presenting every indication, that at some remote period, this region was timbered—the whole of Central Dakota. A lake near was surrounded by large cottonwoods, supposed to have survived fire ravages by being in the water. The supposition is that the whole country here was once timbered and has been destroyed by fire.

What little timber originally existed has been cut off for fuel principally. The larger growth has been utilized for lumber. Under the tree-claim act many acres of timber have been planted; nearly one-fourth of every section, not school lands, is so entered. Besides, all farmers plant trees, regarding it strictly a necessity to have all lands thus protected. All grow rapidly. The planting is principally of soft woods, but oak, walnut, and hard maple are sometimes planted.

BON HOMME COUNTY.

This county being on the Missouri River, the bottom lands are well covered with cottonwoods, box-elder, green ash, and a sprinkling of black, or jack oak. Probably 4 per cent. of the county area is thus timber-clad. All the best has been cut for lumber, and all well cleaned up for fuel. But little of this land has been put in use for agriculture. Where undisturbed, a new, better, and more extensive spontaneous growth of timber is to be found. A correspondent says: "We have three times the area of timber now than before white men came here." This refers to both the natural and planted. "Nearly every section has a timber claim planted," further says the correspondent. "Many farmers have planted as much as 40 acres in timber." The prevailing variety is cottonwood. Yet thousands of bushels of walnuts have been planted, and are doing well. Young groves have been badly injured by prairie fires breaking into them. Cultivation and fire-breaks are found to be the only preventive.

BRULE COUNTY.

The original area of timber in this county was small and very poor. What little there was has long since been used up for fuel. Nearly all who have land are planting more or less timber of various kinds. Many are planting seeds and nuts, and either mode meets with gratifying success. The correspondent is of the opinion that the day is not far distant when timber will be plenty in this county.

CASS COUNTY.

No timber existed originally in this county except a small growth of inferior quality along streams. All has been cut for fuel. There has been a manifest spotaneous growth in localities at all favorable where fires are kept out. Young oaks, hickories, and elms have come up where not even the Indians knew of any timber before. Where the seed came from or how the growth is produced is a mystery. Nearly all timber claims are made for speculation. "The law was well meant, but works badly," says a correspondent. Farmers generally are planting more or less timber for wind-breaks and shelter. Some are planting quite extensive groves. All planting done with care gives satisfaction.

CHARLES MIX COUNTY.

There never was but a small portion of the county in timber of any kind. Nearly all that existed originally was cottonwood, but of good quality for that variety of timber. Half or more of that has been cut for fuel and lumber. None of the land thus cut off has been used for agricultural purposes. Cottonwood does not reproduce itself like other varieties. It is rather nomadic, if that expression be permissible. The seed catches wherever conditions are favorable. It requires clear ground; hence sand-bars and cultivated fields are its abiding places. Much tree-planting is being done in this county, and all does well; cottonwoods are principally planted. Some of the hard-wood varieties are walnut, oak, ash, and hickory. The correspondent urges "enforcement of present laws" in relation to timber

CLARK COUNTY.

The correspondent reporting for border counties in Minnesota incidentally refers to Clark County in Dakota, stating that there was originally quite an area, especially about the lakes, of fair timber, but it was "cut and slashed," and thus all that was of value has been destroyed. The land which was not used is now covered with a fine growth of young timber, giving great promise. "There is no trouble in growing all the timber needed if people will only plant," says the correspondent.

CLAY COUNTY.

Scarcely 1 per cent. of the area of this county was in original timber—principally of cottonwood, and some elm, ash, and box-elder. Half or more has been cut off. Cottonwoods of sufficient size were cut for fuel. Where fires have been kept in subjection spontaneous growth followed, showing at present a large increase of area over the original. There is considerable tree planting, and with marked success. The planting is largely of the soft-wood varieties—cottonwood, willow, soft maple, box-elder, &c. The people of the county have great faith in ultimate results of forestry.

CODINGTON COUNTY.

This county never had any timber of consequence except adjacent to the lakes, and that scattering. The varieties were inferior—cottonwoods and willows. Considerable planting is being done, and with most encouraging success. The correspondent thinks the Government cannot do too much in way of encouraging tree-planting. He thinks in that portion of Dakota with which he is conversant timber of valuable varieties can be grown satisfactorily.

DAVISON COUNTY.

This is strictly a prairie county. It may be said there was no timber when the first settlements were made—simply small brushy growth near streams or protected cañons. The fires had kept down all attempts at spontaneous growth. Since settlements have been made, and care taken to prevent annual fires over the entire surface of the county, there is found to be a new and exceedingly promising natural growth of valuable varieties, such as oak, ash, elm, with willow and cottonwood. This is one of the most important exemplifications of good timber indications, from nothing to start with, showing that there is an embryo tree-growth in even the barren plains. Tree-planting is well under way and meeting with grand success. It is estimated that there is now a planted area equal to 10 acres to each section of land in the county.

DEUEL COUNTY.

There were probably 600 to 1,000 acres scrubby timber growth in this county when settlements were first made. This was kept stunted by annual fires running through it. The varieties were cottonwood, box-elder, willow, and others of minor importance. All were cut for fuel. The young growth now is far in excess of the original, and of better promise. Every farmer has planted more or less, and with most gratifying success. While most planting is of soft woods, no little of the hard woods are planted, and with equal success. There is a good

forestry feeling in this county, and very much will be done. Where fires are kept in abeyance the spontaneous growth is encouraging.

FAULK COUNTY.

No timber existed originally in this county, except a few willows along the streams. The county is new, the first settlers having come within two years, and those went to work at once planting timber. Sufficient time has not yet intervened to demonstrate what can be done. Settlers have faith and are acting in accordance therewith.

GRAND FORKS COUNTY.

About one-twelfth of the area of this county was in timber four years ago. It has been well cut over and used for lumber, fuel, and building. No steps of consequence are being taken to replace what has been cut and used. Where the land is left unmolested, a new and promising young growth comes forward at once. But little planting is done, although the conditions for reproduction are all that could be desired. Where fires are checked, a spontaneous growth appears where none was known before. The new growth is principally of the hard-wood varieties. One of the correspondents from this county, K. O. Skatteboe, treats at some length, and in detail, of "the duty of the General Government in the matter of preserving and increasing the forests on the public domain." The following is copied, in substance:

In a question of this nature it is hard to define the point where the assistance of the General Government should commence, and where it should end. The old proverb that "Heaven helps those who help themselves" may with justice be quoted in regard to the planting of trees in a prairie country. The United States Government has for years been giving encouragement to this project through its timber-culture laws, wherein it gives 160 acres of land to any one who plants 10 acres of trees and attends to them for eight years.

Although this law was passed with good intent and in the hope that it would be complied with, it is a notorious fact, in this country at least, that the law is a complete failure and only enables those who use it to acquire and hold a quarter-section of land idle until they are in a position to put another right on it, or sell it to some one for a consideration, the last-named person propably using a pre-emption, or perhaps putting on his tree-claim right temporarily, until such time as he is ready to dispose of it otherwise.

The idea of honestly complying with the law by planting trees is so remote as to be scarcely worthy of notice, it being simply as a means of taking land and holding it for the future to decide. This is an injury to the country in many ways that space will not permit of showing. The General Government having provided a law for encouraging the growth of timber, rests there, and appears to consider it has done its part. While there are defects and loop-holes in the law that only those who make can alter, it can scarcely be said the responsibility is at an end. If Congress would declare that a timber-culture entry placed on a quarter-section must remain on it and not be changed to a homestead or pre-emption, it would go far to obviate the difficulty; but, in addition to this, it should ordain that when one person makes a timber culture entry and subsequently relinquishes it, that whoever follows him should take up the first party's contract where he left off, and continue to the end as though no change had been made.

To explain: *A* makes a timber-culture entry, say in January, 1881. In January, 1883, he should plant five acres of trees, but in order to avoid this he sells his right to *B*. As the law now stands, *B* has three years allowed him to plant, and before that time comes round he sells to *C* who also has three years, and so on *ad infinitum*. If the law were so amended that on *A* selling to *B* the latter had to plant trees in the time allow to *A* just as though there had been no transfer, there would be less speculation and more tree-culture.

The Agricultural Department would confer a boon on the people of this country who are alive to the situation if it would urge the remedying of the two objectionable features before stated. Another way in which the General Government could as-

sist would be in the distribution of tree-culture literature. Much labor now expended on tree culture is lost by ignorance of the common laws of nature.

There are undoubtedly men of experience who have expended much time and labor in this field, whose views, if put in the hands of the people, would educate them to a higher appreciation of the value of trees. The Department of Agriculture, in the course of a year issues many pamphlets on various subjects, but although many come under the eye of the writer, he has never seen one, or part of one, devoted to tree culture. If some attention were paid to this at headquarters, and possibly a small appropriation to make experiments with different kinds of trees placed in the hands of a responsible man in this section of country, it would be productive of good and lead to the starting of forestry associations.

The trees now planted consist generally of cottonwood, box-elder, and willow, but if fairly tried other more valuable species would doubtless be found to grow equally well. Of all the tree claims in this district, it is safe to say not more than 2 per cent. are being worked longer than three years by any one party.

GRANT COUNTY.

The original area upon which any timber was growing in this county is estimated at one eighth or one-tenth. The first settlements were made some five years ago. The growth was inferior both in quantity and quality. What was fit for use has all been cut off for fuel. There is but little disposition shown to plant trees. What has been done demonstrates that all surroundings are favorable. Soft woods, however, have only been planted—cottonwood, soft maple, and willow. Annual prairie fires have run into the timber, injuring it badly. The correspondents speak hopefully of the future in the matter of tree planting.

HAMLIN COUNTY.

This county was all prairie. It is said not to have contained a stick of timber of any kind when settlements were first made. The correspondent states that everybody is planting timber of some kind. The varieties thus far planted are principally soft woods; some oak, ash, and walnut. All do well, and the people are greatly pleased with timber prospects. No definite data are obtainable as to number of acres in trees planted.

HAND COUNTY.

Not over three hundred acres in timber existed originally in this county. The varieties are principally of oak, ash, elm, and walnut. Very little has been cut, and only for fuel. "Thousands of acres are being planted," says a correspondent. Prairie fires running into the timber have done much injury, not so much latterly as in former years. The county will soon have all the timber needed for home use. The varieties of timber planted are of the better and more valuable order—hard woods, such as walnut, ash, catalpa, &c.

HANSON COUNTY.

A very small portion of this county was originally in timber, and only along the river banks, about Devil's Lake, and the Black Hills region. All cutting has been done for fuel. Nearly or quite all the original area has been cut over. The land not being used, the new growth is about equal to the old. Beside, there is much spontaneous growth where fires have been kept under. Planted timber does well. There is a good sentiment favoring tree-planting, and much is being done. While principally the soft wood varieties are set out, much of the hard wood, and

more valuable, are being planted. People are pleased with the outlook for the future timber supply. Details as to acres planted or growing, are not given.

HUTCHINSON COUNTY.

This, it may be said, is exclusively a prairie county. A strip of poor quality of willow, black ash, and cottonwood was found along the James River above Yankton when settlements were first made. All has been cut off for fuel and fence posts. Fires confined all timber growth to the streams. Where fire is kept out spontaneous growth is quick to put in an appearance and reaches out from the streams. Quite an interest is manifested in tree-planting. The area planted is not given or estimated. Catalpa, ash, oak, walnut, maple, box elder, elm, and cottonwoods are successfully cultivated.

KINGSBURY COUNTY.

There were not over 25 acres of original timber in this county, and that around the lakes, all being cottonwood and willow. The cottonwoods were of the yellow variety, and good in quality. Much tree planting has been done, both as tree claims and by farmers. All planting thus far has been of soft woods, which grow rapidly, and give speedy returns. The planting has done well.

LAKE COUNTY.

This, too, is a prairie county. There was no timber at first settlement except skirting the lakes and streams, and that not worth naming. There is an extraordinary good tree-planting feeling in this county. One correspondent writes: "I have had trees growing, my own planting, eight years old, measuring 9 inches in diameter, and 25 to 35 feet high. I have 70 acres of flourishing timber growing on my farm, planted by myself, all doing splendidly." And so it is reported all over the county.

LA MOURE COUNTY.

There was no timber originally in this county, save a few straggling box-elder, ash, willow, and swamp burr-oak trees along the James River, of poor quality, and long since used for fuel. As fires are kept back there is more show of timber of natural growth, than when settlements were first made. The county is new, and there is no statistical information on file. That forests can be successfully grown is proven by the flourishing condition of trees planted in almost all parts of the county. Much planting has already been done, both of hard and soft woods.

LINCOLN COUNTY.

But little information has been obtained from this county. Only a few scattering trees were found along the Sioux River when settlements were first made. Much attention is given tree-planting, and all varieties do well. The growth of young trees is said to be remarkably rapid. Spontaneous growth, where fires are not permitted to run over the county, is astonishing.

M'COOK COUNTY.

One correspondent says, in brief: "There is not now nor has there been any native forests in this county." Another says: "Forest trees

seem to thrive well here. All settlers are planting more or less." The varieties planted thus far are ash, walnut, box-elder, cottonwoods, and white willow. This is brief, but to the point.

MINNEHAHA COUNTY.

The original timber area in this county is too small to be worthy of record. A few small groves of elm, ash, soft maple, and cottonwood were to be found, but not of much value for any purpose. They were all cleared off for fuel. The young, spontaneous growth is at present ten times that which existed at the date of the first settlements. Where fires have not been permitted, a growth has appeared where there were no signs of tree-growth before. Land-owners are paying much attention to tree-planting. It is supposed there are from two to three thousand acres of young timber now in the county. Not much hard wood has been planted as yet. What has been planted has done well. The conditions are all favorable, and much more will be accomplished in the near future.

MORTON COUNTY.

In 1872, 5 per cent. of the area of the counties of Burleigh, Morton, and McLean was in timber; 75 per cent. has been cut for fuel, lumber, farm uses, steamboat wood, and railroad purposes. "There has been a general slaughtering of what timber we have had," says a correspondent. There is complaint of much destruction of timber lands and timber prospects, by fire. "The counties named will grow all kinds of timber if fires can be kept in subjection," says another correspondent. Another says: "But for prairie fires great groves of timber would spring up all over the country." Still another states:

Most of the fires are caused by Indians leaving their land and burning Government lands in order to drive the game from other parts of the country to their own lands, where white men are not allowed to hunt. On the other hand, the white man goes on the Indian's land, sets fire to drive the game back. In that way the prairie is kept in a blaze. I have made several complaints to our land officers in the last ten years, in regard to the waste of timber, but there has never been any notice taken of the matter. If there were one good man for each county appointed and paid well for his services to prosecute for firing the prairies and cutting the timber on public domain, it would be the means of growing more timber in the next twenty years than the tree culture business.

RICHLAND COUNTY.

Probably 5,000 acres in this county were originally in oak, elm, linden, box-elder, and cottonwood. Most of this has been cut out and cut over, principally for fuel, but also for other purposes required in improving a new country. A new growth comes forward when the ground is undisturbed. "A great many tree claims are planted," says a correspondent. All farmers plant more or less, and the planting done has been successful. Prevailing planting has been of soft woods. Considerable, however, is of hard woods—walnut, oak, and ash.

SPINK COUNTY.

This is a prairie county, only a few trees of small importance growing along the James and Dakota Rivers. But little planting has thus far been done. Experimenters seem to have little faith, and as a rule have planted in a sort of haphazard way. The result is they have not met with success. Those who planted with care have been abundantly rewarded for their labor. A more intelligent sentiment is prevailing and more successful planting will be done in the future. The varieties planted are cottonwood, ash, maple, and willow.

STUTSMAN COUNTY.

One correspondent says:

I have traveled over nearly all of Dakota east of the Missouri River and considerably west. The country away from streams is destitute of timber, evidently caused by fires. From what I know this county was covered with timber.

This is in keeping with a well-founded theory in the West, that many places now known only as prairie were once timbered, destroyed by fire, and kept in subjection by continued fires. The sustaining evidence is that when fires are put under subjection timber at once appears where none was before known, to white men, at least. It is reported that in this county nearly each section has a timber claim planted on it, which is a very handsome showing. Farmers all plant to some extent.

TURNER COUNTY.

The native timber in this county is not worth naming. A correspondent says: "There are many tree claims in this county; all farmers have from five to twenty acres planted, and all doing well." The varieties are both hard and soft woods. All speak of the rapid growth of timber in this region.

YANKTON COUNTY.

A correspondent settled in this county in 1864. There was more or less timber along the Missouri River, from Sioux City, Iowa, to Fort Piere, Dakota, principally cottonwood, and some of excellent quality. Fifty or more per cent. has been cut off, and used mainly for lumber and fuel. Some has been taken for railroad ties. There is a good native growth taking the place of that cut off. Where land is left unmolested, the young spontaneous growth is promising. One correspondent is of opinion that one-tenth the area of the county is in spontaneous growth. Another states that the possibilitis are unlimited and the advantages great. There was a goodly supply of red cedar in some portions of this county, but this has been cut close, and does not reproduce itself.

Lumber production of Dakota.

BOARDS AND OTHER SAWED LUMBER.

Counties.	1882.	1883.	Increase.	Decrease.
Clay	204,000	306,000	102,000	.....
Custer	75,000	30,000	.....	45,000
Pennington	500,000	500,000	.....	.....
Traill	600,000	300,000	.....	300,000
Total	1,379,000	1,136,000	102,000	345,000

LATH.

	1882.	1883.	Increase.	Decrease.
Pennington	1,000	1,000	.....	.....

SHINGLES.

	1882.	1883.	Increase.	Decrease.
Custer	175,000	90,000	.....	85,000

IDAHO.

But few circulars were sent of either form. Twenty-five were transmitted to mill men and others engaged in lumber trade. Ten returns only were received. The Department had but two correspondents, and neither of them responded. Circulars were sent to all officers, but no replies have been received. A personal acquaintance furnishes the following, which will be of interest:

In connection with the inquiries made and the answers herewith submitted, I deem it proper to add some observations which I hope may be of benefit to the Department. Referring to inquiry 6, it is a common practice with wood-haulers, &c., to encamp in the cañons while employed in getting out timber, and most, if not all, of our forest fires are occasioned by carelessness in failing to put out their fires when they leave. A fire, in 1870, which originated in this manner, in this immediate vicinity, destroyed no less than 10,000,000 feet of timber, injuring this section through the destruction of saw-timber, fuel, poles, and the like to the amount of several million dollars. Severe penalties should be imposed upon all parties carelessly handling fire in the Cañons. The danger of fire from any other source is very slight. Respecting the maintenance of our forestry supplies, I would say that, considering the limited supply, the subject is one of inestimable importance to this section. One practice which is now universal should certainly be stopped; it is the wholesale destruction of young trees. I very much fear that anything which might now be done to prevent this practice will come too late for our region of country.

All the young timber has been cut down and the next two generations will not see a tree, which from this date will make 12 inches in diameter, and it will not be 10 years before Oneida County will be entirely destitute of all timber building-material. The railroads have cleared everything from 5 to 10 inches in diameter for ties, and the farmers have taken everything under the five. Thousands of these small trees are destroyed needlessly. I will mention one item which at first appears insignificant. There are hauled, everything counted, between six and eight thousand loads of timber out of the cañons in the neighborhood of Malad Valley each season. Every hauler cuts down a young live tree to bind his load; it must be green, and pine (the most valuable of our timber) if possible. In this manner, I can truly say from six to eight thousand young trees are annually destroyed, needlessly. Thousands more are cut for what is known as nailing poles or rails—saplings from 1¼ to 2 inches in diameter—which should not be interfered with, as they soon become worthless for fences and are either left to rot or used for fuel. Some law should be enacted which would prevent the cutting of trees, especially pine, under a certain diameter.

I would respectfully submit the following observations, which may not be out of place:

The only kinds of timber which are used here for building and agricultural purposes generally are pine and balsam. These will not grow on the lowlands (valleys), and the only places where they can be cultivated is in the mountains and cañons, where they naturally thrive. The Government should hold out some inducements which will encourage people in efforts to increase the timber acreage of the country. What is known as the timber act does not meet the requirements, as nearly all who avail themselves of its benefits do so for the purpose of securing the land, and not for propagation of timber; besides, the kind of timber cultivated is worthless except for fuel. The timber needed is such as I mentioned, viz, pine and balsam, and it must be cultivated in its natural altitude. Should a person undertake to cultivate this timber where it will grow, he has no protection whatever, and the public, when it sees fit, may come in and avail itself of his labor. Furthemore, not many persons have the capital and inclination to invest in property which cannot be expected to yield returns in less than three or four generations. It appears to me that the Government would ultimately obtain proportionate benefit were it to make appropriations for the maintenance and increase of the timber supplies of this region (*i. e.*, Rocky Mountains) on the same principle as river and harbor appropriations are made. It is very evident that a great portion of this Territory will soon be destitute of available timber, which will greatly injure its popularity and keep immigration away.

I have noticed the last two seasons that numbers of pine trees appear to be dying. They commence by turning red at the tops, and in a comparatively short time show signs of decay at the roots. Trees which I have examined this season, and which are almost hollow at the butts, appeared perfectly sound last season. One small grove, in particular, has become almost entirely infected within the last year and a half. The trees are comparatively small; in fact, the young trees in the neighborhood of the grove mentioned seem to be as badly infected as the larger and older ones. I can discover no cause.

I think it safe to say there is an awakening to the subject of forestry in Idaho. Especially is there being paid more attention and care in protecting the timber they already have. The time when much attention will be given to timber culture is in the very "dim distant."

Lumber production in Idaho.

BOARDS AND OTHER SAWED LUMBER.

Counties.	1882.	1883.	Increase.	Decrease.
	Feet.	*Feet.*	*Feet.*	*Feet.*
Alturas	30,000	25,000	.....	5,000
Bear Lake	1,500,760	700,000	.....	800,760
Idaho	200,000	475,000	275,000	.....
Nez Percés	1,410,789	2,020,088	609,299	.....
Oneida	225,000	350,000	125,000	.....
Washington	100,000	150,000	50,000	.....
	3,466,549	3,720,088	1,059,299	805,760

LATHS.

	Number.	*Number*	*Number.*	*Number.*
Bear Lake	5,000,000	4,000,000	.....	1,000,000
Oneida	40,000	100,000	60,000	.....
	5,040,000	4,100,000	60,000	1,000,000

SHINGLES.

	Number.	*Number.*	*Number.*	*Number.*
Bear Lake	1,000,000	1,000,000	.....	.....
Oneida	100,000	250,000	150,000	.....
	1,100,000	1,250,000	150,000	.....

INDIANA.

A greater number of circulars of Form B were sent to this State than any other, and a less proportionate number of replies have been received. One thousand and sixty-six were sent, and only three hundred and thirty-eight replies returned. Ninety-six circulars of Form A were transmitted, and sixty-nine replies received. Twenty of both forms were sent to personal acquaintances, and twenty replies received. From the ninety-one counties in this State seventy send in reports. Being well distributed we are able, on the whole, to reach satisfactory approximate conclusions.

ADAMS COUNTY.

This was originally a heavily timbered county, with the exception of a small area of openings and small prairie tracts. Seven-tenths has been cleared off and the land put under cultivation. In early days the object was to get rid of the timber in the most speedy way possible, which was by burning. Lumber and other economic uses were unknown as a business, being only incidental for home use. The remaining timber is said to be of "a very general variety"—hard and soft woods. No efforts have been made in the way of reproducing timber, and its loss is not felt as yet. The correspondent does not touch upon details. From a perusal of the returns the conclusion is reached that about all good

timber is consumed, and among the thoughtful they see the need of economy in the use of timber. There is said to be no difficulty in reproducing timber.

BARTHOLOMEW COUNTY.

The first settlements were made in this county in 1820. Then the entire area was covered with valuable timber—oaks, beech, poplar, hard maple, ash, walnuts, cherry, hackberry, elms, and hickory. About one-fourth of the original timber supply yet remains, but the best has been cut. In many portions of the county a promising new growth exists. Like all other timbered regions, in early days, no value was attached to timber, and the general effort was to get rid of it. Nearly all the land was put in use for agricultural purposes. Of late years this has changed; timber lands are the most valuable, and all cut now is put to proper uses. There is no effort made to reproduce timber, and the supply is rapidly diminishing. A correspondent thinks, however, there is a growing feeling looking toward tree-planting in the not distant future.

BOONE COUNTY.

This was a timber county. The entire area was covered with valuable timber—oaks, hard maple, beech, ash, elm, poplar, and other inferior varieties. Fully three-fourths of the timber has been cut off. Up to 1848 clearing was done exclusively for agricultural purposes, and millions of dollars worth of good timber burned simply to get rid of it. There is yet plenty of timber for years to come, but no effort is being made to reproduce it. Where land which has been cut over remains unmolested any length of time a new growth comes forward, giving evidence of healthy reproduction. Very old trees, and well preserved, are indications of soil and other conditions favorable to tree planting.

BROWN COUNTY.

Three-fourths of the area of this county was formerly in heavy timber of valuable varieties—oaks, poplar, beech, hard maple, and hickory. The original supply has been well-nigh cut. Lumber and staves have been made the principal uses of the timber cut. Of course, much has been devoted to domestic purposes—fuel, fencing, &c. The timber remaining of the old growth is inferior in quality. Much of the land cut over was left undisturbed. This shows a splendid young growth, and, if left, will in time largely replace that taken away. A correspondent thinks "they are about out of timber." There is no forest-planting. Much timber was damaged by fire in earlier days, but none of late years worth naming. No information is given relating to ages and deterioration of trees.

CLARK COUNTY

This county was formerly entirely covered with heavy timber—walnuts, poplar, beech, hickory, ash, and sugar-maple. All the good saw-timber has been cut. Three-fourths of all other has been cut and burned and the land used for agricultural purposes. Much valuable timber has been needlessly wasted. Of late years there has been demand for timber for various purposes, and hence there is more economy. But little valuable timber of the old growth remains. Where simply cut over, the new growth, so general, comes forward quickly. There has been considerable planting of black locust, it having been found valuable for

posts and many other purposes where durability is desired. After a careful review, the conclusion is that this county will soon need timber.

CLINTON COUNTY.

"Ninety per cent. of the ninth Congressional district was in good heavy timber when settlements were first made," says a correspondent from this county. About three-fourths of the area has been cut over. The uses of timber are not given, nor the proportion of lands to agriculture. The varieties of timber were all of the hard woods. Thirty per cent. of the county area is in young wood, growing naturally. The conditions for growing timber are reported to be good, but no forest-tree planting is being done.

CRAWFORD COUNTY.

The original timber supply, varieties, destruction, and uses in this county are, as near as possible, the same as in the preceding county—Clark. There has been no attempt to plant. In earlier days much damage occurred by fire, but none of late. The stave trade being large and active, much suitable timber is used in this way.

DECATUR COUNTY.

A correspondent says:

The entire southern portion or half of Indiana was as heavily timbered as any lands I ever saw when I came here, three-fourths of which has been cleared off.

The lands were devoted chiefly to agriculture. Timber was burned by the million feet and cords to get it out of the way. The character of the lumber was excellent—poplar, oaks, walnuts, hickories, beech, sugar tree, hackberry, ash, gum, sycamore, and buckeye. Of late years there has been more of a disposition to husband the timber supply, and yet, says another correspondent, "There will be no scarcity of timber for fifty or sixty years to come." Because of its great value, black locust has been planted extensively in many places. It is of quick growth, and most durable for posts and other underground uses. The high price at present of fuel is inducing great economy. A correspondent says:

Our most valuable timber shows great age, three hundred to a thousand years old, and no indications of deterioration.

While writing from Decatur County, the most important correspondent speaks for the southern half of the State.

DUBOIS COUNTY.

This county originally was all timber—oaks, ash, poplar, and other hard woods. Fully 65 per cent. has been cut over and out. Perhaps 40 per cent. has been cleaned up and the land put under cultivation. Twenty-five per cent. has been cut for lumber, and all the best timber is gone. That remaining is of poor quality, fit only for fuel, fencing, and the like. It is estimated that there is 50 per cent. of the area in young growth. The conditions for growing timber are all of the best. There is, however, no tree planting for forest purposes. Old trees begin to die at the top, the decay extending downward. Oaks, walnut, and poplar show an age of from two to three centuries before indications of decay or deterioration are visible.

FAYETTE COUNTY.

A correspondent speaks for the counties of Fayette, Franklin, and Union. The counties were all originally heavily timbered, with such varieties as walnut, oak, poplar, hickory, beech, ash, and hard maple. Eighty-five to ninety per cent. of the original timber supply has been cut, principally to obtain land for agriculture. Within a few years, at most, it is thought the county of Fayette will be destitute in a measure, as no steps are being taken for reproduction. There is no young spontaneous growth, except an undergrowth where timber has been cut and land left unmolested. All indications are that timber can be grown successfully, but no one has undertaken it. Strange to say, in such a heavily timbered region originally, there has never been a forest fire worthy of note. Comparatively very little of the timber consumed in Fayette has been utilized, other than for fuel and home purposes. Very little has been sawed into lumber.

FLOYD COUNTY.

This county was originally all timber. The first settlements were made in 1807. The varieties are all hard woods of the very choicest quality. Two-thirds of the area may be said to be cut clean. The lumber trade has always been good, and most of the timber utilized. Where chance has been given, there has ensued a flourishing and promising new growth. Of late years considerable attention has been given to tree planting. While no extensive forests have been undertaken, many farmers are planting more or less, and with good success. A correspondent has walnuts of his own planting seventeen years old, 60 feet high, and 25 inches in diameter, each tree producing 1½ barrels of walnuts.

FRANKLIN COUNTY.

The original timber supply, destruction, uses, varieties, &c., are as nearly as possible identical with those of the county last named. One correspondent says, "The growing timber can do little more than supply fuel." Another, referring to "deterioration of trees in value, at given ages," remarks, "We cut poplar and walnut when the upper limbs begin to die at the points. After that the tree will get no better—its life is ending. This is a better guide than age. Trees vary in life like men. Soil and other surroundings determine this, not years."

FULTON COUNTY.

Originally, nearly or quite 80 per cent. of the area of this county was heavily timbered. Fully 75 per cent. of the timber area has been cut over. In early days, all was cut to obtain land for agriculture, and the timber burned. Of late years, a healthy economic disposition is manfest, and timber will be better cared for. The varieties are principally the valuable hard woods. Perhaps one per cent. of the county area is now in young wood, growing naturally. No forest timber is cultivated.

GIBSON COUNTY.

This county was originally well timbered with oak, hickory, hard maple, beech, elm, ash, and other hard woods. One-fourth to one-half has been cut, principally to obtain lands for farming. There are en-

couraging indications of new growth where the land is left undisturbed or thrown out and unused, but it will not supply the demand. Rail fencing is yet much used, and draws heavily on the present limited supply. Of late, wire fencing is being employed, and will decrease the demand for timber. There is no planting of consequence, except in places where the railroads are planting catalpa for future supply of ties. There has been considerable loss of young timber from fires reaching into the young growth. A correspondent referring to the best time to cut timber, says:

Whenever timber has reached its maturity, then is the time to cut to secure the greatest benefit. Timber is like everything else, when ripe it is ready for use. Different kinds of timber vary in maturity, which makes it impossible to intelligently answer this question. The poplar, for instance, grows for generations before attaining its growth; while walnut, maple, and ash make fair lumber in forty years. Oak is perhaps the slowest in growing.

GRANT COUNTY.

This county originally was all timber. Three fourths have been cleared off, largely in early days, to obtain tillable soil, and the timber burned. Latterly, and for a goodly number of years, much good lumber has been made and sent out of the county. All the lumber timber is gone. The remaining timber will supply the home fuel demand for, say, thirty or forty years. There is a promising young growth in many parts of the county, but no forest-tree planting of consequence. Some few enterprising farmers, seeing the end of natural timber supply, are planting for future home use, and with success.

HENRY COUNTY.

This county was originally all timber, and fully three-fourths has been cut. The varieties originally were of hard woods and of good quality, some most excellent poplar. Until of late years there was no economy exercised in use of timber. Much was cut to obtain land for farming, and the timber criminally wasted. Latterly, people have learned the value of timber, and care more for it. The young growth is protected, but no planting is being done. The present supply will suffice for fifty years to come if well cared for. Young growth comes forward rapidly when opportunity presents. Where planted for ornamental purposes, nearly all varieties flourish.

JENNINGS COUNTY.

This has been, and is still, one of the best managed counties in regard to timber. The whole county was originally covered with a dense growth of valuable timber. A correspondent says it has not been destroyed by burning to get rid of it, or any other useless purpose. All has been utilized. The varieties of timber were poplar, oaks, ash, beech, hard maple, walnuts, and hickory. The lumber and stave trade has always been a large and flourishing one in this region, the timber being well adapted to such uses. While a goodly portion of land has been devoted to agriculture, a large proportion has been left undisturbed. After cutting out the best, a new growth soon fills up, especially where not put down to grass for pasturage. One-fifth of the county area is in young growing timber. With present good management, there will be enough timber, and to spare, for generations to come. Oaks in their prime are estimated at three thousand years old.

HAMILTON, HENDRICKS, HANCOCK, HARRISON, JEFFERSON, JOHNSON, LAWRENCE, MIAMI, MONTGOMERY, MONROE, MARION, MORGAN, ORANGE, OHIO, OWEN, RIPLEY, SWITZERLAND, TIPPECANOE, TIPTON, AND UNION COUNTIES.

These twenty counties are in most respects so similar respecting forestry that they are treated under one head. They were all originally heavily timbered, principally with hard woods, valuable both as to varieties and quality. All farming lands were obtained from the dense forest, and of course in early days the object was to get rid of and in no wise protect or care for timber. The mission of those who first settled was to destroy, not to save. Latterly, there has been a well-directed sentiment in favor of protection, and an eye to preservation.

The average estimates from these counties warrant the belief and assertion that the home demand will be supplied for fifty years to come. There has been no planting for forest purposes in any of the counties named. When the time arrives for tree planting in these districts all conditions are favorable. Some of the correspondents are zealous advocates for tree planting, as well as for preservation of the native forests.

In Hendricks, Hancock, Jefferson, and Johnson there is more promise of new timber growth than in the other counties. In all, where land is left unmolested, or turned out after years of culture, the spontaneous growth is abundant and promising. There are climatic influences and changes shown, by reason of denudation or reinvesture. Denudation decreases rainfall and water supply, and increases extremes of heat and cold. Restoration of timber growth and supply has the opposite effect.

With reference to deterioration, the best age to cut, &c., the opinions advanced are about as heretofore presented regarding other sections. Much depends on conditions, soil, heat, cold, and other minor surroundings. Oaks, ash, and poplar are longer in reaching a maximum or mature growth than walnut and some other hard woods. Clearing up undergrowth and putting land in pasturage has served a good purpose in the matter of preventing forest fires.

HUNTINGTON, JASPER, KNOX, KOSCIUSKO, LA GRANGE, LAKE, MARSHALL, MADISON, PORTER, PIKE, SCOTT, SPENCER, SHELBY, SULLIVAN, STEUBEN, VERMILLION, VIGO, WABASH, WARREN, WHITE, AND WARRICK COUNTIES.

These twenty-one counties form another group quite different in most respects from the preceding one of twenty, yet sufficiently similar in themselves to permit reference and report under the same head. They ranged originally from three-fourths to one-tenth timber, or so-called timber lands, or area, varying more as to variety than quality. Even in these partially-wooded sections the aim of the early pioneer was to get rid of the timber. They were earlier, however, in adopting a protective policy, as well as inaugurating tree planting to an extent. It is safe to say, basing the assertion on the reports presented, that there are more acres of growing timber, old and young, in these counties, taken as a whole, than when settlements were first made. And yet no extensive or real forests have been made. There is a healthy growing sentiment in that direction. Forest fires seem to have prevailed in these partially-timbered counties more than in those heavily timbered.

They originate, principally, on the prairie portions and run into the timber. Another singular feature in this group is the increased per cent. of manufactures from native woods over the more densely forested group. The same climatic influences or changes are here observable, viz, increase of timber growth either increases rainfall or retains what falls, and removes complaints of drought. Where new groves of timber have come into existence there are several instances of springs of water appearing where none had before been known, and springs entirely drying out where timber had been cut away and the land left bare.

Lumber production in Indiana.

BOARDS AND OTHER SAWED LUMBER.

County.	1882.	1883.	Increase.	Decrease.
Allen	5,650,000	5,173,000		477,000
Adams	3,300,000	2,690,000		610,000
Blackford	75,000	75,000		
Boone	150,000	150,000		
Crawford	1,250,000	1,000,000		250,000
Carroll	1,575,000	1,250,000		325,000
Clinton	1,275,000	815,000		460,000
Cass	300,000	500,000	200,000	
Dubois	2,250,000	3,650,000	1,400,000	
Delaware	3,050,000	3,250,000	200,000	
Decatur	1,535,000	1,185,000		350,000
De Kalb	200,000	250,000	50,000	
Elkhart	13,250,000	16,250,000	3,000,000	
Fountain	1,825,000	1,750,000		75,000
Floyd	2,300,000	2,150,000		150,000
Fayette	1,250,000	600,000		650,000
Fulton	450,000	480,000	30,000	
Grant	2,000,000	1,550,000		450,000
Gibson	4,500,000	4,300,000		200,000
Greene	3,900,000	4,200,000	300,000	
Howard	63,000	73,000	10,000	
Huntington	3,075,000	2,670,000		405,000
Hamilton	1,654,000	100,000		1,554,000
Hendricks	1,125,000	725,000		400,000
Hancock	1,290,000	920,000		370,000
Henry	700,000	1,300,000	600,000	
Harrison	200,000	150,000		50,000
Jennings	400,000	500,000	100,000	
Jefferson	3,825,000	3,090,000		735,000
Johnson	2,075,000	2,560,000	485,000	
Jackson	2,200,000	1,740,000		460,000
Jasper		100,000	100,000	
Jay	264,000	264,000		
Kosciusko	4,760,000	4,900,000	140,000	
Knox	3,600,000	4,000,000	400,000	
La Grange	1,970,000	2,515,000	545,000	
La Porte	1,172,680	1,505,000	332,320	
Lawrence	2,250,000	1,810,000		440,000
Marion	19,750,000	20,450,000	700,000	
Miami	2,789,000	1,538,000		1,251,000
Madison	3,400,000	3,300,000		100,000
Marshall	3,550,000	4,175,000	625,000	
Morgan	3,302,000	2,950,000		352,000
Montgomery	1,000,000	1,100,000	100,000	
Martin	2,000,000	3,000,000	1,100,000	
Noble	2,448,000	2,560,000	112,000	
Orange	2,125,000	1,200,000		925,000
Owen	200,000	175,000		25,000
Parke	5,264,000	5,400,000	136,000	
Putnam	3,000,000	3,250,000	250,000	
Porter	800,000	750,000		50,000
Perry	750,000	750,000		
Posey	100,000	1,275,000	1,175,000	
Rush	3,850,000	1,925,000		1,925,000
Ripley	600,000	500,000		100,000
Randolph	600,000	900,000	300,000	
Saint Joseph	1,250,000	1,750,000	500,000	
Sullivan	1,200,000	810,000		390,000
Scott	400,000	400,000		
Tipton	2,210,000	2,080,000		130,000
Tippecanoe	200,000	200,000		
Union	1,200,000	1,075,000		125,000
Vanderburg	16,230,000	16,470,000	240,000	
Wayne	2,625,979	2,410,000		215,979

Lumber production in Indiana—Continued.

BOARDS AND OTHER SAWED LUMBER—Continued.

County.	1882.	1883.	Increase.	Decrease.
White	1,400,000	400,000		1,000,000
Warren	1,000,000	600,000		400,000
Wells	2,900,000	3,300,000	400,000	
Washington	1,125,000	720,000		405,000
Whitley	3,560,000	4,740,000	1,180,000	
Wabash	500,000	500,000		
Total	159,952,659	159,983,000	15,774,638	15,804,979

SHINGLES.

County.	1882.	1883.	Increase.	Decrease.
Crawford		100,000	100,000	
De Kalb		100,000	100,000	
Floyd	800,000	400,000		400,000
Huntington	75,000	100,000	25,000	
Hendricks		125,000	125,000	
Kosciusko	800,000	600,000		200,000
Lawrence	200,000	300,000	100,000	
Marshall	900,000	1,900,000	1,000,000	
Posey	100,000	475,000	375,000	
Wells	100,000	100,000		
Washington	100,000	100,000		
Whitley				
Total	3,075,000	4,300,000	1,825,000	600,000

LATHS.

Carroll		900,000	900,000	
Cass	30,000	50,000	20,000	
Dubois	3,030,000	3,630,000	600,000	
Decatur	5,000			5,000
Floyd	500,000	400,000		100,000
Fulton		30,000	30,000	
Grant		300,000	300,000	
Gibson	800,000	900,000	100,000	
Hamilton		100,000	100,000	
Harrison	20,000	20,000		
Jennings	25,000			25,000
Jefferson	100,000	150,000	50,000	
Jackson	20,000	70,000	50,000	
Kosciusko	606,000	877,000	271,000	
La Grange	6,000	10,000	4,000	
Lawrence	100,000	100,000		
Marshall	700,000	800,000	100,000	
Morgan	30,000	50,000	20,000	
Martin	50,000	50,000		
Orange	220,000	100,000		120,000
Owen	25,000	20,000		5,000
Putnam	50,000	75,000	25,000	
Scott	50,000	20,000		30,000
Vanderburg	3,500,000	3,700,000	200,000	
Washington	10,000	10,000		
Whitley	250,000	250,000		
Total	10,127,000	12,612,000	2,770,000	285,000

ILLINOIS.

Much the same conditions and sentiments prevail in this State, relating to causes and prevention of forest fires and the duty of the Government in matter of preservation and increase of forests on public domain, as indicated in other reports, viz: In the West, where timber is naturally scarce, every effort should be made to preserve and encourage natural growth and incite to tree-planting. Illinois being

largely a prairie State, the lumber statistics show better than expected. Still there has been a decrease between 1882 and 1883 of boards of 6,347,059 feet; of shingles, 4,618,000; and an increase in laths of 4,860,705.

Few correspondents have referred to deterioration of timber trees or the best age at which to cut timber. Ravages by fire seem in a great degree to disappear as civilization and improvement advances. In this State, as in others reported, the sizes or dimensions of timber used for sawing purposes are perhaps a grade lower than in the heavy-timbered districts, the least diameter being about 12 inches. One hundred and twenty circulars of Form A were sent to Department correspondents and others of personal acquaintance. Ninety-four replies were received, in such form as to permit the presentation of facts in rather better shape than heretofore.

Of Form B 225 circulars were sent to mills, lumbermen, and others who, it was supposed, could and would furnish the information sought; 130 responses were obtained. There are 101 counties in the State, of which 68 are represented in this report.

BOONE COUNTY.

The first settlements in the county were made in 1835–'36. Then about 20 per cent. of the area was in good timber—oaks, ash, walnut, hickory, elm. The census report for 1870 showed 17 per cent. of the area in timber, young and old; perhaps 15 per cent. now. A goodly portion of the original timber is still standing. That cut has been for lumber and fuel, especially in earlier days, but of late nearly all for fuel. Besides the natural growth, all the prairie farms have more or less groves planted, which do well. The first planting on the prairies was nearly all black locust, which, for a time, did well. The borers finally attacked it, and its cultivation was abandoned. More of the soft woods are now planted.

BROWN COUNTY.

Ninety per cent. of the area of this county was originally in timber, consisting of pine, burr, white and black oaks, maple, beech, ash and poplar, all of good quality. Ten per cent. of the lands have been cut clean, logged and burned for agricultural uses; and 60 per cent. for milling, fuel, and charcoal for iron furnaces. Ten per cent. was destroyed by forest fires in 1871. About 50 per cent. is growing up again, but not likely ever to amount to much. Pail, tub, hub and spoke factories and pulp mills use up the young timber as fast as it reaches say 8 inches in diameter. There is no disposition to plant, but rather to cut down. As to ages of timber and its value, the correspondent thinks, "for general purposes, they will improve after, say, pine, 50 years; oak, 100; hickory, 20; maple, 40; walnut, 60; and poplar, 20."

CARROLL COUNTY.

One-twentieth of the area of this county was originally covered with good timber, but nearly all has been cut off in one way and another, and for various purposes, principally for improving prairie farms, and thus all has been utilized. The land cut over, as a rule, has been left undisturbed, and grown up again with young, promising groves. The possibilities of growing timber are coextensive with the domain, but advantages are not yet sufficiently apparent to induce tree-planting to

any considerable extent. What has been done is encouraging. There have been no fires of late years. The correspondent has paid some attention to tree-planting. He has black locusts and walnuts forty years old from seed planted, and chestnuts twenty-nine years old, which have borne since ten years of age.

CASS COUNTY.

Without giving the original area in timber, the correspondent informs us that oak, walnut, hickory, ash, and elm of an excellent quality abounded in Cass, Menard, Morgan, and Sangamon Counties. More than half has been cut for various purposes, largely for agricultural uses, and also for lumber and fuel. The young forests of natural growth will supply, perhaps, one-half that denuded. Fifty per cent. of the original area is thought to be now in growing condition again. The possibilities for tree-planting are good, and it is believed will in due time be embraced. Nothing has as yet been done.

CHRISTIAN COUNTY.

Not over 10 per cent. of this county was in timber originally. Forty per cent. of the area has been cut, principally for improving farms, for rails, posts, fuel, &c. Some little has been cleared, and the land used for agriculture. The land coming on with new growth is considered of more value than any other. Considerable forest-tree planting has been done, and, where care was exercised, success has followed. The original growth was principally hard woods of no very great value, because of their want of size. No forest fires are reported.

CLARK COUNTY.

The correspondent speaks from experience since 1848. Two-fifths of this county was in good timber originally. The cut has been economically utilized, the poplar and walnut for lumber, oak for rails, cooper stuff, and wagon timber, and hickories for spokes and bent stuff. Much of the best walnut was shipped abroad. Since the ravages of fire have been stayed the timber area has been increased rather than diminished, and is thought to be larger now than in 1848. The rich bottom lands have been cleared and used for farming purposes. Three-fourths of the standing timber is less than one hundred years old. It ranges in size from that of hoop-poles to trees 2½ to 3 feet in diameter. There is no need yet of tree-planting in this county.

CLAY COUNTY.

About one-half the area of this county was originally in timber, which was all cut over and out for domestic uses. None of the land was subjugated for farm use, and has shown a more promising young second growth than the original. The timber area has been increased rather than diminished. The growth is rapid, and no injury has occurred from fire or any other cause. The varieties were not obtained. There is no forest-tree planting.

CLINTON COUNTY.

The correspondent settled in this county forty years ago. Then, he estimates, one-third the area was in timber of the more valuable varie-

ties. One-half or more has been cut, principally to improve prairie farms in various forms. The growing forests will, he supposes, supply say one-half of that removed. Coal is plenty, and wire fence used almost exclusively. Thus the demand is light. There is no forest-tree planting.

CRAWFORD COUNTY.

Crawford and adjoining counties were originally fully two-thirds in good timber—white and black oak on uplands, sycamore, elm, hickories, and maple in bottoms. It has been gone over pretty thoroughly, and what was not cleared for agricultural uses has been culled of all the best. During the first settlements, the cut was principally to obtain land for farming, but latterly more for lumber and home uses. Twenty per cent. of the original area is now in good growing young timber, which has taken the place of that cut off. The supply, especially of young oak, will be sufficient for all demands for many years to come. No attention has as yet been given to tree-planting. Formerly, there was great destruction from fires, but none of late. To protect forests, the correspondent thinks depredators should be treated as Governor Dix directed respecting the man who would pull down the American flag, "Shoot him on the spot."

CUMBERLAND COUNTY.

Nearly or quite three-fourths of this county was originally in good timber—oaks, ash, and other hard woods. Fully one-half the area has been cleared for lumber principally, and some for agricultural purposes. The growing forests will not more than half supply the place of timber removed. There is no probability of forest-tree planting to any extent for some time to come. Trees planted for ornamental uses show great vigor and rapid growth.

DE KALB COUNTY.

Without obtaining data as to the original timber area, the following is gathered from reports: Since 1856 there has been no perceptible change in the home-grown timber supply. In 1872 there were 17,722 acres in timber, including the natural growth and that planted. It is thought there is about that amount now. The original cut not being for farming lands a new growth took the place of the old, of better quality as well as increased area. There are 2,425 farms in the county, many of which have some artificially grown trees, mostly for shelter, windbreaks, and ornamental uses. There are some small forest groves. Forestry can be successfully prosecuted here. "The General Government should have foresters (who will not steal) to oversee the public domain. There should be in every State of the Union schools of forestry, to educate young men in that line," says an intelligent correspondent.

EDGAR COUNTY.

Originally nearly one-tenth of the county area was in timber, the south part being of heavy white, red, and burr oak, hard maple, hickory, elm, and birch. One-half has been cleaned up for agricultural uses, and the balance cut over for fuel, fencing, lumber, &c. The timber lands were first occupied by farmers in preference to the prairie. A few walnut and maple trees have been planted in groves for forest purposes. There is more timber now than when settlements were first

made. Coal is largely used for fuel, and thus the demand is constantly decreasing. Thirty years ago timber lands were bought for $40 per acre. Now wood lands can be had for from $15 to $20. The prairie lands then sold for from $5 to $8 per acre; they now command from $35 to $60.

EDWARDS COUNTY.

About three-fourths of this county originally was in good burr, white, red, and water oaks, hickory, elm, gum, &c. One-third of this has been cut over. The cut has been principally for fuel and domestic uses, although a small portion of land was cleared for tillage. A better young growth exists than the original. There is no tree-planting.

FRANKLIN COUNTY.

A correspondent treats not only of Franklin County, but in general terms of Southern Illinois, which was formerly covered with timber of valuable varieties, principally oaks, walnut, ash, hickory, poplar, also the soft woods to some extent. About one-half the area has been cleared and put under cultivation. All has been culled over, and the best taken. Much of the timber was burned on the ground. Of later years, all that could be used for lumber has been disposed of in that way. Large supplies of piling, fencing, fuel, and such have been obtained. Until lately timber has not been properly valued. Lands cut off and left undisturbed are producing valuable new growth.

This area is estimated at one-third that of the original, and produces about the same varieties as the first. Of course, under the conditions narrated, there is no forest-tree culture, but planting has been confined to ornamental purposes, which demonstrates the possibility for future tree growing to be good. There have been no fires of late years. The old growth was much injured by forest fires. The correspondent, who is intelligent and well posted, referring to the value of timber at various ages, deterioration, &c., expresses the opinion that hickories are of more value young than older. As to durability of walnut, there is no perceptible difference between that cut young or old. All varieties should be cut in their prime and while in vigorous growth.

GALLATIN COUNTY.

In 1857, fully 80 per cent. of this county area was covered with forests. The Wabash and Ohio River bottoms and valleys were covered with a growth of large, heavy, black walnut, ash, and other valuable varieties. All these have long since been utilized for lumber, and but little economy displayed in cutting. More than half the wood has been needlessly destroyed to obtain land for agriculture. At present rates of destruction and consumption, in ten or twelve years no timber worth naming will be found in the county. Not over 20 per cent. of the entire area is now in timber of any kind. The new growth has not been of the valuable original varieties. There has been no planting for forest purposes. The conditions for successful tree growing are good. Black walnuts grown from seed of sixteen years' planting show a diameter of 14 or 15 inches. Efforts are being made to awaken a tree-planting interest, and the correspondent is of opinion that tree-planting is of paramount necessity.

GRUNDY COUNTY.

Ten per cent. of the counties of Grundy and Livingston, embracing forty townships, were originally covered with fair timber, containing some valuable oaks. Fifty per cent. has been cut for fencing and fuel, and a little for lumber. Some forest planting has been done with gratifying success. Oaks and walnuts, among the hard woods, are planted, and have done well. As the coal supply is good, the demand for wood fuel is light. Being near Chicago, where lumber can be obtained abundantly and cheaply, there is but little inducement to plant forests. The correspondent thinks the time is near at hand when more attention will be given forest-tree planting.

HANCOCK COUNTY.

It is supposed one-fifth of the area of this county was in timber when the first settlements were made. Four-fifths of this have been cut off, some to be used as grain lands, but principally to obtain the wood for various domestic purposes. About one-third the land cut over is growing in natural groves of great promise. Forest trees planted grow very rapidly. But little, however, is being planted, other than for ornamental purposes.

HENDERSON COUNTY.

About one-fourth of the county area was originally what was called timber land—in fact, really good, consisting of oak, walnut, ash, hickory, elm, linn, hard and soft maple, cottonwood, and willows. It is estimated that one-fourth of this has been cut clean. Where left undisturbed, a new growth takes the place of the old. The cut was used for lumber, fuel, fencing, and all general domestic purposes. A goodly portion of the land cleared was employed for agriculture. There is twice as much of growing timber at present as forty years ago, more than half being natural or spontaneous. Walnut, maple, and cottonwood principally are planted. There is a growing feeling favoring tree-planting.

IROQUOIS COUNTY.

About one-tenth of this county was in timber of small growth. One-fifth has been cleared off. The balance is standing for pasturage principally, and thus well protected from fires. No attention of consequence has been given to tree-planting. The conditions are favorable when a sentiment can be worked up in its favor.

JOE DAVIESS COUNTY.

This county borders on the Mississippi River, and the land is rather of rough or mountainous character. Forty years ago the timber was badly damaged by fire. The uplands have been largely cleared for agricultural uses, but the bottom lands have so improved in timber growth that there is perhaps now more timber in the county than ever before. The varieties are valuable hard woods. Wood lands are mostly fenced in and fires guarded against. There is no tree planting except for ornamental purposes.

JOHNSON COUNTY.

The whole county when settlements were first made was covered with a timber of excellent quality in the main, oak, walnut, hickory, poplar,

and other varieties of lesser value. Three-fourths of the area has been cut and cleaned up for agricultural uses. Much of the timber has been wantonly destroyed. The stave trade has been large, and quantities of timber fit for such use have been consumed for that purpose. There is no demand for tree-planting, and not many think that there will ever be any lack of timber. The main object seems to be to destroy what there is.

KANE COUNTY.

Reports from this county are exceedingly meager. There were originally some good walnuts and oaks, which were cut for lumber. Nearly all the original area has been cut or culled over, the young growth being about equal to that cut off. Some very successful tree-planting has been done, and one correspondent states:

An artificial forest of ten acres near me has yielded better income and profit than the same number of acres in corn for the same period.

KANKAKEE COUNTY.

About one-tenth of this county was originally in timber. There is now a greater area of natural growth than forty years ago. The varieties are not given, and the dimensions of the growth when settlements were first made are reported small. For many years at commencement of settling, the forests suffered by prairie fires running over the entire county annually. The cut has been principally for fuel, and very little taken used for agriculture. Hence that cut over has not reproduced itself handsomely. Quite a tree-planting feeling prevails, and the interest is increasing. There is an abundance of coal for fuel, and therefore the demand in that respect is not great. Good varieties of timber are being planted with most encouraging success.

KENDALL COUNTY.

Nearly all the county is prairie, not over one-eighteenth being in any kind of timber. There are very good oaks, walnut, hickory, and some soft woods along the few streams in the county. All has been cut quite close, and used principally for fuel, fencing, and farm improvements. Some of the best oaks and walnuts have been worked up into lumber of good quality. There has been no waste; all has been utilized. Very little tree-planting has been done as yet. Where the land cut over has been left undisturbed a new growth, as usual, comes forward.

KNOX COUNTY.

While correspondents in this county do not give data as to the original timber area, the conclusion is drawn, from what is written as to uses and varieties, that a large portion of the county was in good timber. One tenth or more has been cut and used principally for fuel and farm improvements. The natural growing forests, with what has been planted, will equal, if not exceed, the original area. But little has been done in way of tree-planting, but the possibilities are all that could be desired. A growing feeling is perceptible in that matter. A correspondent sums up his reply relating to deterioration of timber, or best time to cut, by saying, "All varieties should be cut as soon as vigorous growth ceases."

LA SALLE COUNTY.

The correspondent does not venture an estimate even of the original timber area, nor indicate what the varieties were. He thinks that 35 per cent. of all the timber growth of the Illinois River has been cut or cleared off. There are some good white and burr oaks remaining. The larger proportion of the cut has been for "coal props." Much of the land is being used for pasturage and very little for tillage. Standing timber will more than supply all demands. All the original timber area in the county has been cut over years ago. A new growth comes where land is left undisturbed. Considerable planting has been done, of walnut, catalpa, maple, ash, and box-elder.

LEE COUNTY.

When the correspondent settled in this county, forty-six years ago, about one-twentieth of the area was in good timber. Most of this has been cut off. In known instances the second crop has been cut, and the third is now growing on the same ground, where land was left undisturbed after cutting over. The original growth was principally hard woods. Very little land was cleared for farming uses, hence left to produce new growth. There is now a greater area of natural growth than at the date of first settlements. Where timber has been cut away, the severity of winter, and storms at other seasons of the year have been intensified. Much tree planting has been accomplished, and where this has been done on the prairies, and where the naturally reinvested forests have again obtained size, there has been a perceptible modification of climatic conditions. This is an interesting report in this respect, and based on nearly a half century's experience. The correspondent, Abraham Brown, of Dixon, concludes by saying:

I am pleased with Commissioner Loring's efforts in protecting and increasing our natural timber. It should have engaged the attention of the Government long ere this.

M'DONOUGH COUNTY.

One-third of this county was originally in wood, principally oak and hickory. Two-thirds of this has been cut, principally for fuel, fencing, and lumber. There is now a greater area of second and spontaneous growth than when the first settlements were made. Nearly all the prairie lands are in cultivation or under fence. Much planting has been done, especially, considering the original timber supply, and success has universally followed efforts in this direction. Planting has been fairly divided between the hard and soft wood varieties. There appears to be a good forestry sentiment prevailing in this county.

M'HENRY COUNTY.

The old settlers agree that there is now much more timber in this county than fifty years ago. Until sufficient settlements were made to protect it, fires ran through annually what timber there was. Trees, it is stated, are as easily and cheaply grown as corn. The better varieties are being planted in this county. As facilities for obtaining coal and lumber in all parts of the county are good, the demand for home production of timber is not great.

M'LEAN COUNTY.

The correspondent has been a resident of this county for thirty-nine years, and speaks of the counties of McLean, Tazewell, and Woodford, the latter two being nearly or quite one-half in timber originally, but not so much in McLean. About all the timber has been cut off or over. A large portion of land originally in timber is now in improved farms, and very little valuable timber is left. Oaks predominated originally, and the new growth is principally of the same varieties. There are some good young walnut groves. Considerable walnut was sawed and shipped in earlier days for nearly all conceivable purposes—lumber, rails, posts, fuel, railroad ties, &c. Perhaps 10 per cent. of the original timber area is now in young natural growth. There is no tree-planting of consequence. What has been done in this direction is of the hard-wood varieties, and with success.

MADISON COUNTY.

One-sixth the area of this county was originally in timber of different varieties of oak, hickory, walnut, elm, sycamore, and some soft woods. One-half the timber land has been cut clean and subjugated for farming uses. The timber was not of first quality. It had been injured by fires running through it in early days. A spontaneous growth has increased the area of timber, so that really, counting out what land is now in farms formerly timber, there is more timber now growing than originally, and of much better quality. Coal is used for fuel. Much of the timber-land is fenced in and put down to grass for pasturage. No one thinks of planting trees for forest purposes. Lands, it is thought, will bring better returns in other uses. "A regular forestry system is the only feasible plan to encourage and protect forests," says a correspondent.

MARION COUNTY.

One-fourth of this county, it is supposed, was originally covered with good hard-woods. Seven varieties of oak are reported, together with black and white walnut, hickory, hard maple, and ash. The best has all been cut for lumber, and the refuse used for fuel. Some serious losses by fire occurred in earlier days. There is not much call for tree-planting as yet, but the conditions are favorable. As in other similar instances, a new growth takes the place of the old where land cut over is left undisturbed. Also in rough places, and along ravines, where fires are kept out, encouraging spontaneous growth appears and flourishes.

MASON COUNTY.

There were, originally, for what is known as a prairie region, some groves of very fine timber in this county in early days. These have been long since cut for fuel and fencing. As coal is now almost universally used, and wire and hedges employed for fencing, there is comparatively no demand for timber for these purposes. At or near the original groves, where land is not in cultivation, and about "draws," ravines, and protected localities, there is always an encouraging spontaneous growth of young timber, principally of the hard woods. There is now a much larger area covered with growing timber of natural growth than the original. In addition, much planting has been done, and nearly every farmer has from one to five acres. Already from

these planted groves many obtain a full supply of posts and such fuel from the *débris* of young timber as is desirable. Walnut, black locust, and soft maple principally are planted.

MONTGOMERY COUNTY.

Half the original area of this county was in timber, embracing some large and fine walnuts, which were cut exclusively for lumber. Much of the land has been cleared up and used for agriculture. One-half the original supply has been cut clean, the balance culled, and the new or second growth is principally of burr and black oak. While there is no artificial planting for forest purposes, the coming spontaneous growth is thought to be sufficient for home demands for many years to come.

MORGAN COUNTY.

At least one-half of this county was originally in timber, but none scarcely large enough for saw purposes. There is no evidence of fire having gone through it, and the quality was extra good. One-half the original area has been cut off, mostly for home uses in fitting up and improving farms and land used for agriculture. Probably upon one-fourth the ground cut over and left undisturbed a second growth is coming nicely. There is no forest-tree planting. Forest fires have not occurred for thirty years past. "After timber reaches the age of one hundred years it deteriorates at the rate of 20 per cent. per annum," says the correspondent.

MOULTRIE COUNTY.

Only about 15 per cent. of this county was originally in timber of any kind, but there were some good varieties of oak, walnut, and shell-bark hickory. Nearly all has been cut for uses in improving prairie land. With this meager timber supply, no planting of consequence has been done. Comparatively none of the land cut over has been used, and a new growth has sprung up, extending its encroachments on adjoining prairie lands. Thus there is really more young timber growing at present than the original area.

PEORIA COUNTY.

Over half this county was originally timbered with walnut, cherry, burr, white and black oak, elm, maple, and ash. The more valuable varieties have been cut off for lumber, rails, and fuel, as needed. The undisturbed lands cut over are covered with a dense young growth 5 to 15 inches in diameter, all of exceeding promise. A goodly portion of land cut over was cleaned up for agricultural uses. Nearly all the standing timber lands are in grass for grazing stock. There is no tree-planting, but trees can be grown advantageously when demanded.

PIKE COUNTY.

Formerly this county was about one-half timber, in oak, black walnut, honey locust, ash, hard and soft maple, linden, and some other varieties of less value. Three-fourths of the land has been cut over and perhaps one-half cleared up for agriculture. Where near enough to market the cut was used for fuel, and under other circumstances burned

up to get it out of the way. The young forests of natural growth will probably supply one-half that cut away. No planting is being done.

POPE COUNTY.

All of the area of this county, except a very small portion of "barrens," was originally covered with timber, principally of valuable hard wood varieties, but generally not of size for saw timber. Nearly all the land cut has been cleared, and used for agricultural purposes. Therefore there has been great waste and but little utilization. More than half the area has been cut out. There are no young growing forests, either natural or planted. The indications are that new growth would come on quickly, if denuded lands were left undisturbed.

PULASKI COUNTY.

The entire county south of Makanda was originally heavily wooded with oak, poplar, walnut, hickory, and other valuable varieties. This may be said of all the southern and eastern portion of the State, particularly Pulaski and Alexander Counties. Seven-tenths has been cut off, perhaps three-fourths to obtain use of the land for agriculture. This was cut and burned, any way to get rid of it, good timber and poor. Where the land was merely cut over and not cultivated, less valuable varieties of new growth have sprung up, principally of black and sweet gum. But little effort has been made, therefore, to replace timber cut away. No fires have occurred of late years. The punishment for depredators on public domain suggested by a correspondent is, "Catch and put them to work improving the National Park."

PUTNAM COUNTY.

It is thought 30 per cent. or more of this county was originally in good timber, the uplands being in oak, maple, walnut, ash, hackberry, and other hard woods of less value and importance. The river bottoms contained soft maple, cottonwoods, elm, &c. Quite a number of farms have been carved out of the timber regions, say 5 per cent. of the timber lands; other cutting has been done for practical purposes. The timber has not been wasted. The young growth taking place of that cut, and the increasing spontaneous growth will more than supply the loss. There has been, as yet, no forest-tree planting, but the conditions are favorable, and in time will be embraced. As coal is used for fuel, and wire employed largely for fencing, the demand for wood is greatly decreased. The official reports show 34,000 acres in timber, principally of young growth.

RANDOLPH COUNTY.

The correspondent speaks from a resident experience of twenty-five years, from which the following is gleaned: At the time he settled, this county was about equally divided between prairie and timber, but now about one-third is timber, young and old. The varieties were general, embracing hard and soft woods. The soil being good, it has been and is yet desirable for agricultural purposes; therefore there is more than the usual disposition to get rid of the timber. But little tree-planting is being done. Referring to the query as to "What the General Government should do for the preservation and increase of forests on the public domain," a correspondent replies forcibly: "Hang by the neck, until dead, every rascal found stealing. Plant plenty of walnuts."

RICHLAND COUNTY.

The original area of this county is supposed to have been two-thirds in oak, hickory, and other hard woods. In the past fifteen years about one-half has been cut over, principally for railroad ties, posts, fencing, and lumber. In 1872 there were 75,618 acres in timber, as shown by official records. No attention is being given to tree-planting, and but little economy exercised in the use of timber cut. Much of the inferior quality is burned to get rid of it. There have been no fires within the recollection of the correspondent.

ROCK ISLAND COUNTY.

Nearly or quite 60 per cent. of this county was originally woodlands' containing some good timber of white and burr oak. One-fourth the area has been cut and cleared in about equal proportions for fuel and agricultural purposes, and some for lumber. The natural growing young forests will supply, say, 80 per cent. of that cut away. There is no forest-tree planting worth naming except for wind-breaks, ornamental uses, and the like. The conditions for tree-planting are good, and it is believed enterprise will soon lead in that direction.

SAINT CLAIR COUNTY.

The correspondent, who seems to understand what he is writing about, says, in substance, that Southern Illinois, 50 miles north from Cairo, was originally all forest, and is still well covered. The spontaneous or new growth more than keeps pace with the destruction of timber. The variety of woods are mixed, hard and soft. There is yet, and will be for many years, a good supply of valuable timber in Southern Illinois. North of the first 50 or 60 miles, except in the bottoms, there is very little timber of value. The valuable tracts are fast disappearing. Where not put under cultivation the new growth is equal to the old area. The correspondent is of opinion that there is now a greater area of natural growing timber in South Illinois than when the first settlements were made.

SALINE COUNTY.

Originally this county was nearly all in timber—white, post, burr, pin, red, Spanish, and black oak, hard maple, honey locust, black walnut, ash, catalpa, hickory, and gum. Fifty per cent. has been cut and cleaned up for cultivation. The better varieties of timber were used for lumber and the general market. There is timber enough remaining to answer all demands for fifty years to come. There has been no suffering from forest fires and no need exists for planting trees. Some planting, however, has been done about farms and residences, for ornamental purposes. Black walnut, black locust, hard maple, and catalpa show exceedingly rapid growth. Hard maple can be used for manufacturing at forty years old; the others named at 15 to 20.

SCHUYLER COUNTY.

Originally at least four-fifths the area of this county was forests, consisting of the several varieties of oaks, ash, walnut, hickory, elm, cherry, and sycamore. Perhaps one-half has been cleared for agricultural pur-

poses, but there is yet much valuable timber remaining. There has been but little needless waste and no serious ravages by fire. In many places there is a promising spontaneous new growth. There is no need for tree-planting, and there is timber enough, if husbanded, for generations yet to come.

SHELBY COUNTY.

Twenty years ago one-third the area of this county was covered with valuable timber, one-fourth shell-bark, white and black hickory, and the balance oaks, black and white walnut, hard maple, elm, sycamore, cherry, and hackberry, of quality unsurpassed. One-fifth of the timber area has been cleared off for farming purposes. The young spontaneous forest growth is about one-fifth that cut off. Along streams bordering on prairie lands, when left undisturbed, the new growth reaches out and increases in width annually. But this lively and valuable natural increase seems not to be appreciated, being cut and slashed to an alarming extent. It is possible to grow timber in all parts of the county, and a few of the more intelligent farmers are doing it. Valuable varieties of hard woods are being planted. There have been no losses by fires for many years. The timber lands are all fenced in and put down in grass for pasturage. Timber is regarded most valuable, oaks, at 80 to 100 years; hickories, 20 to 40; walnut, 60 to 150, and soft maple at not so great an age.

STARK COUNTY.

One-tenth of the original area of this county was more than fairly covered with hard woods of different varieties and of good quality. One-sixth has been cut and cleared up for agricultural uses. The timber was all utilized. That which could be worked into lumber was so used and the balance taken for fuel, fencing, and general domestic purposes. Where land cut off has been left undisturbed, as usual in such instances, a new and encouraging growth puts in an appearance. In very early days there was quite a rage for planting black-locust seeds in groves where they were to remain permanently. Much benefit was derived therefrom, both as storm protectors and for posts and fuel. In course of time they were attacked by the borer, and nearly all the groves destroyed. Of late years the devastators have disappeared, and fine groves are again flourishing. No other forest-tree planting of consequence has been done. Some destruction to forests by prairie fires leading into them has occurred. Coal supplies suffice for fuel. An unknown insect, or worm, destroyed all young hickories.

STEPHENSON COUNTY.

There are 35,000 acres of land in this county, originally estimated at one-fourth timber and the balance prairie. In 1881 official records show 37,696 acres in timber; 1882, 26,362 acres; and 1883, 21,893. This refers to natural growth. The varieties of timber are white, burr, and black oak, hickory, and maple. The original timber-stand was much injured by fire, but none of late years. The first cutting was for lumber, fuel, and fencing; now more is being cleared for farming use than ever before. As the timber is now disappearing the entire supply will be exhausted in less than thirty years. The need of planting timber does not seem to have impressed itself on the people thus far, and but little tree-planting has been done. It is thought there will be an awakening to the importance of the subject, the possibilities of which are good.

TAZEWELL COUNTY.

The correspondent has resided in the county since 1838. Then about one-tenth the area was in timber, of good quality—oak, walnut, ash, hickory, hard maple, and other varieties of less value. About all the ground has been cut over—at first, principally for lumber, fuel, &c. Of late years the Germans have cleared up and used the lands for agriculture. Coal now being used for fuel and pine lumber and wire for fencing, the demand is not great for home grown timber. There has been no forest-tree planting of note, but the conditions are favorable.

VERMILLION COUNTY.

It is estimated that one-twentieth the area of this county was originally wooded. Ten per cent. of that has been cleared for agriculture, and the best-adapted timber utilized for various purposes, mainly for farm improvements. The original varieties were hard woods. Lumber is imported principally, and as there are vast coal-fields in the county, the demand for home timber is limited. Young natural growth puts in an appearance wherever an opportunity is afforded, and grows rapidly. Many farmers on the prairies are planting groves for their own use, from which they realize handsomely in a very few years. Osage-orange for hedge and wire for fence are used extensively. The county is taking care of itself in timber-growing.

WARREN COUNTY.

The correspondent is brief, his whole report being in these words:

This county is nearly all prairie. A narrow strip of timber skirts the small streams, which is all our native supply, and not enough for fuel except in the immediate locality where grown. A spontaneous growth comes up where fires are kept out and land is undisturbed. The growth is rapid. Soft woods have been planted to some extent, and with success.

WAYNE COUNTY.

Without stating the area originally in timber, from the fact that 225,000 acres are reported now in timber, after one-fourth has been cut, it is safe to say this county was well timbered. The varieties named are oak, hickory, ash, maple, elm, gum, &c. The clearing was principally for agricultural purposes, in the commencement. Now timber is being cut for building railroads, lumber, fencing, manufacturing, &c. Of the 225,000 acres now growing 10,000 acres are reported to be good timber, the balance being young. With care the supply will meet the home demand for generations. There is no forest tree planting. When it shall be demanded, however, it can be done successfully. No injury has occurred through forest fires. Of late years insects have injured the young growth to some extent.

WHITE COUNTY.

Ninety-five per cent. of the land in this county was originally timber, and of good quality and useful varieties. Eighty per cent. of the timber area has been cleared out and land used for agricultural purposes. Until of comparatively late years the main object has been to get rid of the wood, and, therefore, there has been great waste. There are no young forests, or old ones decaying from age, and no tree-planting. The out-

look is not encouraging, and the county is substantially timberless. Timber can be grown to advantage, which is shown by that planted for ornamental uses. Strange to say, forest fires have never been known even to the earliest settlers.

WHITESIDES COUNTY.

Not more than 1 per cent of the county area was originally timber or woodland. Nearly all has been cut and land put under cultivation. The original growth was principally oak, and of no great value, except for fuel, for which purpose it has been almost exclusively used. There is no young natural growth of consequence, and no forest-tree planting. Some has been done for shelter and wind-breaks. The possibilities are good, but for some reason settlers have not yet seen the importance of tree-planting.

WILL COUNTY.

This county was originally well covered with timber, principally of valuable hard woods. Probably 10 per cent. of the timber lands have been cut over, but very little for exclusively farming purposes. There has been no useless waste; all has been utilized in various ways, such as improving farms, for fuel, &c. It is thought there are nearly 10,000 acres in young timber, but not much tree-planting is going on, although the conditions are very favorable. More will be done in the near future.

WILLIAMSON COUNTY.

A very large proportion of this county was originally in timber, say, five-sixths, and of good varieties—oak, walnut, hickory, sycamore, poplar, and some soft woods. Two-thirds of the the original timber land has been cut, at first principally to obtain land for agriculture, but latterly for railroad ties, lumber, and domestic uses. About all the valuable timber has been felled. Probably one-sixth of the original timber area is again clad in a new and promising young growth. There is some planting of timber already, notwithstanding the plentiful supply of nature. Black locust, black walnut, chestnut, and other valuable varieties are being planted with success. No forest fires have occurred for many years. "I cannot see," says the correspondent, "that forest fires have injured anything for forty years." He advocates cutting timber young to secure its greatest value.

WINNEBAGO COUNTY.

About one-sixth the area of this county is supposed to have been originally in timber, principally hard woods of rather small character of growth. In some of the valleys and along streams good oaks, black and white walnuts, were found. Three-fourths of the first supply has been cut for fuel and fencing. Since prairie lands have advanced in price, these lands have been cleared up for agricultural uses, giving really a good second crop of timber. All the land left undisturbed, after cutting off, sent up a new growth. Official returns show 21,643 acres of timber in the county, planted and natural growth. Much attention has been given to tree-planting. Larch and Austrian pine have given great satisfaction. Larch twelve and fifteen years old, show a growth of 20 to 25 inches in diameter; black walnuts, same age, 12 to 15 inches. Considerable damage has ensued from fires. The correspondent is of opinion that exemption from taxation for tree-planting would incite additional work in that line.

Lumber production of Illinois.

BOARDS AND OTHER SAWED LUMBER.

County.	1882.	1883.	Increase.	Decrease.
	Feet.	*Feet.*	*Feet.*	*Feet.*
Adams	11,533,099	15,000,000	3,466,901	
Bond	275,000	540,000	265,000	
Cass	650,000	824,000	174,000	
Crawford	250,000	200,000		50,000
Cumberland	1,500,000	2,000,000	500,000	
Coles	600,000	400,000		200,000
Clark	800,000	900,000	100,000	
Cook	1,000,000	1,000,000		
Effingham	3,600,000	3,600,000		
Fulton	1,700,000	2,650,000	950,000	
Fayette	2,200,000	1,825,000		375,000
Gallatin	2,000,000	2,000,000		
Jasper	2,300,000	2,100,000		200,000
Jackson	4,520,000	3,500,000		1,020,000
Knox	120,000			120,000
Kingston	50,000	50,000		
Kendall	50,000	50,000		
Logan	250,000	300,000	50,000	
Lasalle	150,000	100,000		50,000
Madison	2,716,231	2,286,271		29,960
Macon	300,000	250,000		50,000
Massac	14,500,000	11,000,000		3,500,000
McDonough	200,000	200,000		
Marion	460,000	540,000	80,000	
Morgan	200,000	300,000	100,000	
Ogle	150,000			150,000
Pope	500,000	400,000		100,000
Pike	100,000	340,000	240,000	
Pulaski	7,662,000	7,580,000		82,000
Rock Island	73,000,000	67,500,000		5,500,000
Saint Clair	100,000	100,000		
Shelby	650,000	600,000		50,000
Sangamon	40,000	40,000		
Schuyler	750,000	250,000		500,000
Saline	500,000	1,500,000	1,000,000	
Union	2,250,000	1,700,000		550,000
Vermillion	2,000,000	2,000,000		
Wabash		500,000	500,000	
Williamson	330,000	440,000	110,000	
White	2,310,000	2,454,000	144,000	
Whiteside	12,000,000	12,000,000		
Total	154,066,330	148,719,271	7,689,901	12,526,960

LATHS.

	Number.	*Number.*	*Number.*	*Number.*
Adams	8,139,285	7,000,000	3,860,715	
Pope	200,000	100,000		100,000
Pulaski	2,150,000	1,850,000		300,000
Rock Island	13,400,000	12,750,000		650,000
Whiteside	2,900,000	2,850,000		50,000
White	100,000	100,000		
Wabash		100,000	100,000	
Total	21,889,285	26,750,000	3,960,715	1,100,000

SHINGLES.

Adams	4,718,000	1,200,000		3,518,000
Rock Island	11,000,000	10,900,000		100,000
Whiteside	6,000,000	5,000,000		1,000,000
Total	21,718,000	17,100,000		4,618,000

IOWA.

For obvious reasons mill-men and lumber-dealers are slow to impart details of their trade. Private letters were addressed, in addition to circulars, to the greater portion. One hundred and forty-three circulars of Form A were sent to Department correspondents, and 125 of Form B to mill-owners and lumber-dealers. One hundred and thirty-three of both forms were sent to personal acquaintances. Replies have been received from 94 Department correspondents, and 96 from mill-owners and lumber-dealers. From those sent to personal acquaintances 102 replies were returned. It will be seen that from the 99 counties in the State, 68 are represented in this report.

The difficulties encountered in this mode of work are many. Few correspondents seem to comprehend the questions propounded; not a single one has answered all the inquiries, and but two have touched upon that very important question relating to the deterioration of trees. That relating to the duty of the General Government as to preservation and increase of forests on the public domain has been tenderly and vaguely answered.

Injury by fires in Iowa have not been worthy of mention.

The answers to question 4, Form B—"What is the average number of logs required for making 1,000 feet of lumber"—are so nearly uniform as to permit saying in general terms from 5 to 8.

The least diameter reported in cutting logs for sawing is 8 inches.

Very few ills affecting timber growth are reported. In Van Buren County white oaks are singularly and fatally affected. They commence to die at extreme topmost limbs, the disease running down rapidly, so to speak, to the ground, and killing the tree. It is doubtless a species of tree-blight. This has been noticed to a limited extent among all varieties of oak on bluff lands, along the Mississippi River, in Nebraska.

The totals for "boards and other sawed lumber" show, for 1882, 296,257,598 feet; for 1883, 233,809,139 feet—exhibiting a decrease or falling off of 35,448,459 feet. It is not presumable that this decrease in lumber supply is in any way indicative of decreased demand. On the contrary, in a State as rapidly developing as Iowa, the ratio of natural increase in demand would be greater than this shown decrease in supply. From the fact that very many reports add notes, "mills stopped," "removed to new location," "timber supply exhausted," and such like, it is reasonable to conclude that this decrease in lumber is attributable to a diminished supply of timber.

The lath exhibit shows a gain of 23,539,863, and shingles of 240,027.

ADAIR COUNTY.

It is supposed that one-fifteenth of the original area of this county was timber, principally oaks, ash, elm, hickory, and other hard woods. Nine-tenths have been cut, and what remains is of little value. In an early day considerable cutting was for lumber; latterly, almost exclusively for fuel. But little attention has been given to tree planting. Walnut, catalpa, ash, maple, and box-elder have been planted, and have done well.

ADAMS COUNTY.

Originally, about one-fortieth of the area of this county was timber of good quality—oaks, elms, black walnut, hickories, and other less

valuable hard woods. One-eighth of this has been cut. Young timber rapidly took the place of old where cut, and thrives seemingly with more vigor than the old. Much of the land has been cleared for agricultural uses, but the timber was not wasted, being used for saw-logs, fuel, posts, fences, and other domestic purposes. Coal is cheap, and thus reduces the demand for fire-wood. This will be a permanent feature. Barbed wire takes the place largely of boards and rails for fencing. Tree-planting is said to be a grand success. While the varieties thus far have been largely of the soft woods, ash, black walnut, oaks, hickories, and elms are being planted with satisfaction. Years ago prairie fires did much damage, but of late there have been none of consequence.

ALLAMAKEE COUNTY.

Originally, about two-thirds of this county was oak openings and hazel-brush, and one-third open prairie. On the ridge lands, red, white, and burr oaks and some hickory were found. Along the streams there was a very limited supply of black walnut, basswood, elm, and sugar maple. About one-half the land thus timbered has been cut, principally for fuel, but some for manufacturing purposes. The newly-grown groves, which have taken the place of the old ones, are the more promising. It is estimated that 50,000 acres are now in young wood, growing naturally. There has been no forest-tree planting.

APPANOOSE COUNTY.

The original growth of this county is about all cut; none of consequence for purely agricultural purposes, but nearly all for fuel, fencing, and building. Over one-tenth of the county is now covered with second growth and planted timber, white, red, and burr oaks of good quality largely predominating. Young hickory and white oak are being cut for hoop-poles, and at a ruinous rate. The young growth will suffice for all future uses, except sawed lumber. Considerable attention was given years ago to planting black locusts, but borers destroyed them, and their cultivation ceased for a time. More recently the pest seems to have disappeared, and the locust is being again planted. Farmers in this county suffer in dry seasons from fires, ignited by sparks from railroad engines. To protect the public domain, "enforce present laws," says a correspondent.

BENTON AND TAMA COUNTIES.

No estimate is given as to the original timber areas of these counties. The correspondent includes both Benton and Tama Counties. Twenty-five per cent. of the original growth has been cut in Benton and 40 per cent. in Tama. The original varieties were walnut, ash, maple, basswood, elm, and cottonwood. The cut was principally for fuel and partly to clear land for farming. At present 3 per cent. of the land in Benton is in young wood growing naturally; in Tama, 10 per cent. Artificial groves are growing on 80 per cent. of the farms in both counties. The correspondent speaks with the experience of forty years' residence. He says there is more timber now than when he first came. He is of opinion that the present State law exempting from taxation for timber-planting is better than anything the General Government can or will do. Cultivated timber in these counties is largely black walnut.

BLACK HAWK COUNTY.

"Thirty years ago there was a heavy growth of valuable timber along streams and adjacent bluffs, the varieties being largely hard woods. The greater part of the original supply has been cut." The uses were largely lumber, and also for fuel and general domestic purposes. No great attention has been given to tree-planting, but the conditions are favorable. Nearly all varieties of forest trees do well. Ash, walnut, catalpa, and white pine have been planted successfully. The correspondent says in regard to the duty of Government in the matter of increase of forests on the public domain: "Repeal the timber-culture act; appropriate sufficient means to plant and care for an arboretum on some part of the ground belonging to each of our agricultural colleges. It is probable 100 acres would be sufficient."

BREMER COUNTY.

The correspondent speaking for Bremer, Butler, and Chickasaw Counties, fails to estimate the original timber supply, but places the cut at from 5 to 10 per cent. The original varieties were principally hard woods, cut for lumber and fuel. None of the land cleared has been used for farming, but has been permitted to grow up again. The new growth is exceedingly promising. No reports have been received as to tree-planting, and yet the possibilities are said to be excellent.

BUCHANAN COUNTY.

Of the 16 townships comprising the area of this county, about 2 may be said to have contained timber. There yet remains about the original area. It has been drawn on lightly, and coal is in use almost universally for fuel. Since fires have been kept in subjection woodland is constantly encroaching on the prairie lands. The timber cut off has been used principally for fuel and fencing. The original growth was oaks, black walnut, hickory, elms, poplar, linden, and hackberry—all vigorous and healthy. There are no signs of deterioration of consequence. Planting trees is largely praticed. Eight per cent., in acres, is now producing timber, reckoning both natural, spontaneous, and planted.

BUENA VISTA COUNTY.

Ten years ago there were about 1,000 acres of timber growing in this county. It is about all cut off for fuel. There is no systematic effort for reproduction, and yet it is estimated that nearly as many acres are planted as have been cut. Willow, cottonwood, and maple are planted, simply about improved premises, as wind-breaks and for purposes of protection.

CALHOUN COUNTY.

One-ninth of the land in Calhoun was originally covered with a fair grade of timber—some hard woods, but largely of the soft. The timber lands have been terribly devastated for the past twenty years, and but little remains of the original, and that scrubby and of small value. Appreciating the advantages of timber, the people are planting very generally and with gratifying results. Now about one acre to every forty is in timber, either planted or spontaneous. The original timber was used principally for fuel, but much of it has been wasted.

CERRO GORDO COUNTY.

This is a prairie county. Originally there were not over five or six sections of native timber. The varieties were poplar, linden, jack and burr oak, but the ax and fires have cleaned out about all the old timber. Old settlers estimate that there is now 25 per cent. more natural or spontaneous growth than twenty-nine or thirty years ago. The official records show 1,200 acres timber planted and doing well; the varieties are not given.

CHEROKEE COUNTY.

Three per cent. of this county was originally timber, largely of soft woods, such as cottonwood, maple, willow, and linden, with some walnut, oak, ash, hickory, and elm. One per cent. has been cut, and that very judiciously, by thinning out the older, to give advantages to the younger growth. The timber showing, even of the original growth, is thought to be better and more promising than when settlements were first made. A new growth has added handsomely to the timber area. The advent of railroads has decreased the home demand, and pine lumber and coal are largely introduced. Much attention has been given to planting; nearly every farmer has from one to ten acres in groves, all in flourishing condition. Cottonwood, maple, and willow take precedence; ash, walnut, and oaks are growing in favor. The correspondent is of the opinion that hard woods are most valuable and remunerative, cut at from twelve to fifteen years old.

CHICKASAW COUNTY.

The original growth of this county was of oaks, elms, hickories, ashes, walnuts, maples, and basswood, all of fair quality. About 5 per cent. of the county area was timbered, and at least 25 per cent. has been cut, used for lumber, fuel, rails, building timbers, railroad ties, &c. Where fires are kept out, young timber grows rapidly, showing a large per cent. of increase of area over the original. Trees planted, of almost all varieties, do well; some, of course, flourish better than others. Very little loss has occurred by fires for the past twenty years. In earlier days prairie fires swept the entire region. A correspondent does not think the present timber act "just the thing," but he knows of nothing better.

CLARK COUNTY.

Six-eighths of this county was originally timbered with oak, walnut, hickory, elm, maple, and cottonwood. Eight per cent. of this has been cut. The introduction of coal and lumber by rail has greatly decreased the drain on the native supply. The new growth is more than equal to the original consumed. Much timber-planting is being done, but principally of soft woods. Fires have been prevented by cultivating the lands.

CRAWFORD COUNTY.

This county was sparsely timbered at the time of first settlement mostly by soft woods, and used for fuel and fencing. The spontaneous growth has more than filled the place of the original supply. The acreage planted in timber is estimated at one to every twenty-five under cultivation for farms or agricultural purposes. This information is given by a correspondent of twenty-eight years' residence and experience.

DAVIS COUNTY.

One-half this county was originally covered with timber—oak, hickory, elm, ash, hackberry, black walnut, soft maple, linden, cottonwood, and birch. There yet remains much good oak, but the balance is rather indifferent in quality. Most of the timber was cut to obtain ground for farming and consequently has been largely wasted. Of late much of the oak has been used for railroad building. Shaved hoops are important in the timber industry of this county. There is no need for forest planting as yet.

DECATUR COUNTY.

This county was settled by Mormons in 1846–'47. Thousands of acres of timber were cleaned off by them for agricultural uses. They left in 1853–'54, and since that time a new growth of timber has come up of great value. Walnut trees of this growth show a height of over 50 feet and a diameter of from 12 to 18 inches; burr oaks nearly the same, and maple and cottonwoods twice that or over. There is more and better timber now than thirty years ago. The correspondent entertains the opinion that "we need not plant timber; the natural growth is ample." Timber, in order of value, is estimated: Black walnut, burr oak, black cherry, white oak, ash, and hickory, with not much difference between soft woods.

DELAWARE COUNTY.

Probably one-tenth of the area of this county was originally in timber, 10 per cent. of which has been cut. The timber remaining consists of oaks, pine, hickory, ash, walnut, and poplar. Much of the clearing has been done for agricultural purposes, the wood, however, not being wasted, but utilized in all cases. The new, natural growth far exceeds that cut off. Farmers generally plant small groves for home use. They commence cutting when from ten to twelve years of age. One-tenth of the county area is thought to be now in growing young timber, planted and spontaneous; a correspondent closes by saying, "Substantially what is said of Delaware may be said of Clayton County."

DES MOINES COUNTY.

One-third of the original area of this county was timber. One-fourth has been cut, and much of the land denuded used for agricultural purposes. The timber in earlier days was taken principally for fuel, fencing, and other domestic purposes. Latterly the land has been cleaned for railroad ties. The original growth was oak, walnut, cherry, hickory, hackberry, and other and less important hard woods. Where land has been cleared and left undisturbed a fine, new, and promising young growth springs up and does well. The new growth will supply about 70 per cent. of the old. No attention is given tree-planting except for ornamental purposes. The correspondent says: "I have been here thirty-six years, and have never known of any damage to timber by fire." Referring to increasing forests on the public domain he says: "Sell not more than 160 acres to any one man, and compel him to plant a specified number of trees before the title is perfected."

DICKINSON COUNTY.

One seventy-fifth of this county was originally timber. Nearly all has been cut off, but young growth of oaks, elms, ash, basswood, maple,

and cottonwoods will in a short time more than replace that cut. The possibilities of planting forest trees are unlimited. In the matter of preserving and increasing forests, the correspondent writes: "The Government should sell no prairie land except upon condition that the purchaser shall plant and keep growing a certain specified number of acres in forest trees."

DUBUQUE COUNTY.

It is supposed that one-fifth of this county was originally in timber of fair quality, largely white oak and black walnut. One-fifth is estimated to have been cut off for fuel and agricultural purposes. Cord wood is as cheap to-day, in the city of Dubuque as it was twenty years ago. Where old timber has been cut a new and vigorous growth springs up, giving much promise. But few trees have been planted, except for ornamental purposes or wind-breaks, and those principally of soft maple.

EMMET COUNTY.

This county is composed of twelve townships, 3,000 acres of which were originally well timbered with oaks, elms, walnut, and the common varieties of soft woods. Three-fourths of the original supply has been cut and used for lumber, fuel, and fencing. There is more timber now than when the first settlements were made. Where old growth is cut away a new one puts in an appearance at once. From 3,000 to 4,000 acres have been planted in forest groves, largely of cottonwood, maple, and white willow. No fires of consequence have occurred.

FAYETTE COUNTY.

The native growth of this county consisted of oaks, ash, black and white walnut, elm, and linden. About one-fifth the area of the county was timbered, one-fourth of which has been cut away. Little has been cleared for farming purposes, but the principal part for lumber, rails, fuel, railroad ties, &c. The spontaneous growth now more than equals the original. But little attention has been paid to planting forests.

FLOYD COUNTY.

This county was originally one-eighth timber—jack oak, elm, basswood, and some poplar of inferior quality. About two-thirds have been cut and used for fuel and fencing. Growing forests will not supply one-fourth the demand. The possibilities of forest planting are good, but poorly improved. But little is done, save for wind-breaks.

FRANKLIN COUNTY.

This being a prairie county, but little primitive forest ever existed. What little there was has long since been cut off. Since fires have been kept in abeyance, a thrifty and prosperous growth of young timber has shown itself in nearly all propitious portions of the county—hard woods, oaks, walnuts, hickory, hackberry, elm, basswood, and cherry. Much attention is given to planting trees, and with gratifying success. Varieties planted are hard maple, honey locust, beech, chestnut, catalpa, ash, ailanthus, and cottonwood.

FREMONT COUNTY.

Twenty per cent. of the area of this county was originally in timber; on the uplands, burr oak, hickory, elms, and ash; on the bottoms, cot-

tonwood, soft maple, box-elder, and other soft and unimportant varieties. Not over 5 per cent. of the native forests have been cleared, but there has been more culling than cleaning. The uses of timber have been for lumber and fuel. The young growth on the uplands has more than taken the place of that cut, but upon cottonwoods, in the bottoms, there is a loss or decrease of not less than 2 per cent. The supply of lumber timber is exhausted. The general demand for timber has diminished of late years by reason of the introduction of coal for fuel, and wire and live hedges for fencing. Under these circumstances, the growing supply will be in advance of the old or original. Not much attention is given, as yet, to tree-planting, but success has attended efforts made in that direction.

GREEN COUNTY.

Not one-fiftieth of this county is, or has ever been in native timber. Since the coal developments, native forests have greatly increased. Timber belts are confined to the Des Moines and Coon Rivers and tributaries. There has been no clearing away of timber for agricultural purposes, but it is used mainly for fencing and a little for fuel. Perhaps 50 per cent. of the native timber area is now set with a valuable growth of young timber, estimated at 10,000 acres in the county. The possibilities for forest planting are all that could be desired, and the advantages to be derived therefrom are incalculable. The farmers not planting to some extent are the exceptions. Timber planted in 1870 now furnishes all the fence-posts and fuel needed on farms, where 5 or 10 acres were planted. One correspondent, referring to the preservation and increase of forests on the public domain, says forcibly, if not truthfully: "While Congress shows so little care for fostering material development, I feel I can make no suggestion as to the duty of the Government."

HAMILTON COUNTY.

Six per cent. of the original area of this county was covered with oaks, walnuts, hard and soft maple, elms, ash, basswood, and cottonwood. Ten per cent. has been cut and used for fuel, building, and fencing. No denuded land is taken for farming. The new growth of natural young wood more than equals that which has been cut. Farmers all plant from 2 to 25 acres of timber, principally of soft woods. To increase forests on the public domain "repeal duty on foreign lumber," remarks the correspondent.

HARDIN COUNTY.

About 10 per cent. of the county was formerly forests of hard woods. One-third of the original supply has been cut, leaving, as near as may be, equal proportions of the original varieties, excepting black walnut, all of which that was large enough to work up into any use has been cut. The timber cut has been mainly employed for fuel and fencing, and some for lumber. The forests planted and of natural growth are double the original area.

HARRISON COUNTY.

One-twenty-fifth of this county was originally in timber; on the uplands, oaks, elm, hickories, and other hard woods; on the bottoms, cottonwood. Ten per cent. has been cut for fuel, rails, lumber, and farming use. The new timber growth is 1 per cent. more than the original. The

possibilities for planting forest trees are good, but little is done. "Amend the homestead law, making it obligatory to plant and cultivate a stated amount of timber before patent issues," says the correspondent.

HARVARD COUNTY.

The original timber area of this county has not been obtained. "The natives cleared off about one-half," says the correspondent. As valuable natural groves are promising, and nearly all the farmers have timber plantations, it is believed there will soon be more timber in the county than when it was first settled. Timber cut has been used principally for fuel. Coal is largely used at present for fuel, and wire for fencing. This materially lessens the demand for timber.

HENRY COUNTY.

Seventy-five thousand acres in this county were originally covered with very fine timber. The correspondent says: "The finest body of timber west of the Mississippi River existed from Skunk River to Big Creek, principally in this county." The varieties were black and white walnut, oak, hard and soft maple, red cherry, hackberry, hickory, birch, and cottonwood. One-half the area has been cleaned off, and the best timber taken from the other half. Until five years past, the entire fuel supply was wood. A fair proportion of the land cleaned off has been used for farming purposes, and the timber employed for lumber, fuel, fencing, and railroad ties. Where the land has not been cultivated, a new growth comes forward at once, and there are now, perhaps, 30,000 acres of young wood growing naturally. Farmers on prairie lands all plant groves of from 1 to 20 acres.

HUMBOLDT COUNTY.

One per cent. of this county was originally in good timber of the better hard-wood varieties. Very little has been cleared off, but much fearfully culled. The best was taken for rails, and the refuse used for fuel. None of the cleared lands are used for agricultural purposes. For the past ten years the new spontaneous growth has been about two-thirds of that cut. Gratifying improvement is noted in forestry matters in this county. Farmers are planting groves, largely of the hard woods. The correspondent adds: "What is narrated of Humboldt may be said of Wright, Kossuth, and Pocahontas Counties. Webster, on the south, shows a higher per cent. in all respects." As to the duty of the Government for the preservation and increase of forests on the public domain, the correspondent is peculiarly pointed. He says: "If $20,000,000 of the sum now paid out for pensions could be turned in that direction it would be better applied than it is now."

IDA COUNTY.

There was no native timber in Ida County originally, except along Maple River and its tributaries. Most of this growth has been cut for fuel. The indigenous varieties of timber have not been obtained. About 300 acres of young, natural growth are said to be in good condition. Much attention has been given to tree-planting. This, with the spontaneous growth, is supposed to greatly exceed the original supply. The varieties most successfully cultivated are black walnut, ash, catalpa, box-elder, and soft maple. Walnut and ash are the most profitable.

IOWA COUNTY.

Twenty per cent. of the primitive forests of this county have been cleared for cultivation. There are thirty or more thousand acres of young, spontaneous growth. Oak, walnut, ash, hickory, maple, and cottonwood give promise of future value. About 20,000 acres, where, when the first settlements were made, scarcely any timber was visible, are now thick with promising growth. The original growth of timber was cut for lumber, fuel, rails, posts, &c. There has been but little tree-planting, but where done success has followed. Larch, Scotch, and white pine, black walnut, ash, honey locust, and hardy catalpa have all given satisfaction. Soft maple, cottonwoods, box-elder, and willow are more largely planted.

JACKSON COUNTY.

This county was originally well timbered, the trees covering fully one-half the area—oaks, walnuts, hickories, elm, ash, hackberry, and maple, and of good quality. One-half is supposed to have been cut for various uses, principally for lumber and fuel. There has been twice as much new spontaneous growth as that cut. But little attention is given to artificial tree-planting; none, in fact, has been done save for ornamental purposes. No injurious fires have occurred of late years. The correspondent thinks "hard woods are at their prime at fifty years." [Your reporter takes decided issue, as will be seen by reference to his extended views in a paper presented the Department, devoted more especially to this feature of forest products.]

JASPER COUNTY.

The correspondent epitomizes his reply to the circular, by saying: "The natural forests have been cut off more than fifty per cent. during the last thirty years, in Congressional districts V, VI, and VII. The timber remaining is nearly all of inferior varieties and quality, such as elm, cottonwood, linden, and box-elder. Oaks and walnuts are all gone." The uses have been mainly for fuel, fencing, and general farming purposes; oaks and walnuts have been largely converted into lumber. Growing forests more than make up in quantity what has been destroyed, but lack in quality, by reason of age. Many thousand acres of trees are being planted, the varieties being principally hard woods, walnuts, oaks, hard maple, with cottonwoods, soft maple, box-elder, &c. "A rigid and honest enforcement of the present timber act is all sufficient," says the correspondent, referring to the duty of the Government in matter of increase of forests on the public domain.

JEFFERSON COUNTY.

The extent of original timber in this county is not furnished. One-half is said to have been cut for fuel, bridging, lumber, fencing, &c. There is more land now covered with new natural growth than when the county was first settled, yielding from fifteen to twenty-five cords of wood per acre. Good lumber timber is very scarce; still there is more disposition to cut off than to plant. The correspondent has faith in the spontaneous growth. He says: "There is no need to plant. Sufficient will grow naturally, if let alone." Wire fencing is said to be an immense saving of timber.

JONES COUNTY.

One-sixteenth of the land in this county was originally timbered. Ten per cent. has been cut and the denuded lands used only partially for farming purposes. The timber remaining is oak, on the uplands; on the low lands, elm, basswood, and maple, and valuable only for fuel. The timber cut has been used mostly for fencing, fuel, and building. As the lumber brought in is principally of pine, growing timber will keep up the supply for fuel. Nearly all thrifty farmers have planted groves, and many are now depending entirely on them for fuel. A grove of five acres, eight years old, will supply a family with all the fuel needed. Cultivating lands, with close pasturage, seems to guard well against fires. A correspondent is of opinion that "increased population and such care as sensible people will exercise, will sufficiently preserve and increase forests on the public domain," and also that "timber should be cut when in growing vigor. When it ceases to grow, deterioration commences; after which, the sooner cut the better."

KEOKUK COUNTY.

Fifteen per cent. of this county's original area was in timber—walnut, hickory, ash, elm, basswood, &c. Five per cent. has been cut for agricultural purposes, fuel, lumber, &c. That remaining is of less value in quality than the original. The natural growth is now double that of the original area. Planted groves are to be found on nearly every farm, both for protection and future timber uses, in extent, perhaps, twice that of the original, and after spontaneous growth. No losses have occurred by fire worthy of note; everybody seems to be careful. The land is all owned by citizens, hence they are not particularly interested in the outside public domain.

KOSSUTH COUNTY.

One-thirtieth of the original area of this county was covered with oaks, hard and soft maple, black walnut, linden, and other varieties of hard woods. The greater portion has been cut off, largely for fuel, rails, fence posts, and lumber, but none for agricultural uses. Including artifical planting there are now many more acres of timber than when the county was first settled, estimated at 10,000 acres of young timber. Considerable attention is given to forest-tree planting. Lombardy poplar was used to considerable extent, but being short-lived, has been discarded. For wind breaks and protection willows are found to be preferable. Cottonwoods have shown a growth of over 2 feet in diameter in less than twenty years. For permanent planting, black walnut is found the better tree. No fires worth noting have occurred. The correspondent thinks that sowing land in blue grass is an excellent bar against spreading fires. It keeps the sward green, in which condition fire will not run over the ground.

LEE COUNTY.

The correspondent does not venture an estimate of the original timber supply. The varieties were walnut, oak, elm, hickory, ash, and cottonwoods. Thrown out lands quickly run to a new growth of cottonwood and elm. Years ago, much of the land was cleared for farming purposes, especially where the timber was small and inferior. The spontaneous growth at present is about 20 per cent. of the area cut. Some

attention is being given to tree planting, and interest in this direction is on the increase. The correspondent intelligently remarks, referring to the age at which trees should be cut in order to secure their greatest value: "All depends on the use for which designed. Young timber is more tough and elastic than old, and should be used for agricultural implement purposes, especially tool handles; medium age for machinery, wagons, &c., and still older for lumber, posts, and rails. Most varieties in this region are past their prime for any purpose, at from eighty to one hundred years of age."

LOUISA COUNTY.

One-tenth of this county was originally timbered land. Over one-half has been cut, formerly for fuel and latterly for railroad ties. The natural timber area is not diminished, as the young growth has been equal to, if not exceeding, that cut out. The young growth is not yet available to any extent, but it is promising. No attention has been given to forest planting. Wood for fuel commands only $1 per cord in the tree.

LUCAS COUNTY.

The report from this county is meager. No wooded tracts worthy of note, and no material change, except in planting. Fifteen per cent. of area, it is thought, would be a safe estimate of the young, growing timber. Coal is used exclusively for fuel, and lumber is brought in. The advantages all favor forest-tree planting; the soft woods mostly are grown.

LYON COUNTY.

The reports from this county are substantially the same as for Sioux. The correspondent is an old Wisconsin lumber man. Speaking of preserving the public domain, he says: "Treat timber thieves and depredators as you would any other burglars." Referring to the deterioration of trees at given ages, he remarks: "I believe a tree never deteriorates in value while in growing condition."

MADISON COUNTY.

About 50 per cent. of the original growth of this county has been cut off and used for fuel, lumber, posts, fencing, &c. About 25 per cent. of the area of the district has young wood now growing, including both artificial and natural growth. The varieties are hard maple, elms, oaks, black and white walnut, hickory, hackberry, and linden.

MAHASKA COUNTY.

Probably one-tenth of this county was originally timbered, mostly along the streams. Coal being plentiful and cheap, wood fuel is not an item of importance. No artificial tree growing is done except for ornament and wind-breaks. The cutting has been for fuel and lumber, but timber is now principally used for propping coal mines. The remaining timber is good; the varieties being oaks, walnut, ash, hickory, basswood. A few groves of young trees of spontaneous growth are known. They grow rapidly and are valuable. There is no disposition, however, to plant for forest purposes.

MARION COUNTY.

Ten per cent., and the most valuable, of the original growth of this county has been cut off clean; 75 per cent. of which has been used for building, fencing, and railroad purposes. Very little of the cleared land has been devoted to agricultural purposes. Where cleaned off a new growth takes the place of the old. The spontaneous growth has increased 50 per cent. more than the original area. The possibilities of forest planting are good, and yet but little attention has been paid to it. The little done, however, in this direction has been well performed, and valuable varieties planted of hard woods, principally walnuts, oaks, ash, locust, with less of cotton woods, maples and box-elders.

MITCHELL COUNTY.

This is called an open prairie county, with but little original timber. With the aid of coal, it has about held its own in the matter of original growth. Some tree-planting has been done, and with success, and more is likely to follow. The original growth was oak, maple, basswood, and cottonwood, and the varieties most successfully planted are walnut, box-elder, maple, and cottonwood. Willow is preferable to Lombardy poplar.

MONROE COUNTY.

Thirty per cent. of this county was originally timber, of extensive and valuable varieties: white burr and black oaks, black and white walnuts, red and white elms, hackberry, red and white hickory. Nearly all has been cut, and the land generally put under cultivation. Where it is not cultivated a new and promising growth has sprung up. The timber cut was judiciously utilized for lumber, fencing, fuel, &c. While there has been no particular effort to reproduce timber, the present young supply is believed to be equal, at least in area, to the original. The correspondent states that, in his opinion, this report includes the southeastern portion of the State, extending 150 miles west of the Mississippi River and 100 miles north of the Missouri line.

O'BRIEN COUNTY.

Originally about 300 acres of the sixteen townships composing this county were in timber. All the old growth is cut. Official records now show 3,185 acres in young timber, five hundred of which, it is estimated, are of spontaneous or natural growth. The old growth was used for fuel exclusively. The correspondent is of opinion that all would be timber in this county but for fires.

PAGE COUNTY.

The original timber area of this county is estimated at one-twentieth, the varieties being burr, white and red oaks, black walnut, cherry, elm, hickory, maple, box-elder, linden, and poplar, in the order named, as to quantity. All the hard woods are of good quality. About one-tenth has been cut for farming uses, fuel, and lumber, about in equal proportions. Timber is not so much of an object since the opening of coal mines and the introduction of wire fencing. Nearly all farms have a nice grove, or one in process of growing. There are more than twice

the number of trees now growing in the county as when it was first settled. "No public domain here, and no forest fires," says the correspondent.

PALO ALTO COUNTY.

A very small proportion of this county was originally timbered. Nearly all has been cut for domestic uses. The original varieties were oaks, elms, maple, and linden. No timber was cut to clear land for agricultural uses. The present spontaneous growth is more than double that of the original. It is estimated that the artificial or planted growth is eight times greater than the spontaneous. All planting has been successful and satisfactory.

PLYMOUTH COUNTY.

The natural timber growth in this county was exceedingly limited, and has been mostly cut off. There were some ash and oak, but cottonwood, willow and box-elder predominated. A State law of Iowa exempts from taxation, for a term of ten years, $100 valuation, for each acre of forest trees planted. The records for this county show 2,924 acres planted under the provisions of this law. Perhaps twice that number of acres have been planted, the large proportion before the passage of the act. The varieties planted are not given, but reported in general terms to be doing well when cared for. The correspondent thinks "the timber act good, where people are honest, and Government officials not easily hoodwinked."

RINGGOLD COUNTY.

One-fourth the area of this county was originally covered with timber and brush. One-fourth of this has been run over and culled, but very little cut off clean, and less still used for farming. Some of the best was taken for lumber; the principal part, however, has been consumed in domestic uses. One-half the owners of land have either planted or are now planting trees, and yet it is thought the new growth visible at present will not supply the demand. Timber growth is slow but firm and good in texture.

SCOTT COUNTY.

Nearly 7 per cent. of the area of this county was covered with timber, principally oaks, and with few exceptions along streams. Forty per cent. of this has been cut. At least 2,700 acres of young native trees are now growing. Tree-planting is rising in favor, and increasing each succeeding year. The varieties planted are walnut, poplar, ash, oaks, hickory, maple, and cottonwood.

SHELBY COUNTY.

One-sixtieth of this county was originally in timber. Fifty per cent. has been cut and used for fuel and fencing, basswood, elm, and a few black walnuts remaining, of poor quality. It is estimated that three thousand acres of young timber of spontaneous growth is in a flourishing condition, and that an average of one acre to each quarter section of land in the county has been planted.

SIOUX COUNTY.

The correspondent for this county says: "All the timber has been cut off clean in Sioux, Plymouth, Lyon, and Osceola Counties. The growth was originally along Floyd, Sioux, and Rock Rivers." Farmers are planting generally, and meeting with success. The varieties used are walnut, catalpa, ash, cottonwoods, and willows. No other details have been obtained from this county.

TAYLOR COUNTY.

There was originally about 5 per cent. of timber in this county, all of which is cut off. There is a new spontaneous growth now much larger than the original, and thousands of new groves have been planted. The old timber was taken for domestic purposes, and none cleared for agricultural use. A new growth is up and growing rapidly.

UNION COUNTY.

A very small proportion of this county was originally covered with timber, but it was of good quality, consisting of oaks, walnuts, hickory, maple, &c. Nearly all has been cut for lumber and fuel. The conditions for tree-planting are most encouraging. All farmers and land owners plant largely and of the best varieties—hardwoods, pines, and larch, but sparingly of the soft woods. No estimate as to number of acres or trees planted and growing is given.

WASHINGTON COUNTY.

The correspondent has been a resident forty-one years, and asserts that there is more timber now of native growth than when he came, to say nothing of that planted. Most of the large timber has been cut, but the younger growth is rapidly taking its place. But little land has been cleared for agricultural purposes, the timber having been principally employed for fencing and building. Tree-planting has been successful. Pines, spruces, walnut, maple, and other valuable varieties do well. Maples show a growth of 24 inches in diameter in twenty-four years. In the matter of deterioration, the correspondent says: "I have cut many oak and walnut trees, taking concentric rings as indications, that were from three hundred to five hundred years old. They seemed to be in their prime."

WINNESHIEK COUNTY.

Several large streams of water flow through this county and are well timbered, as are also some of the adjacent table-lands. Seventy-five per cent. of the original supply has been cut. That remaining, and which is typical of the original, consists of oaks and poplars. The cut was principally for lumber, fencing, and fuel. The first houses were nearly all built of logs. The second growth is more than supplying the demand, especially as wire fencing is being so universally brought into use. No attention has been given tree-planting for forest purposes. The correspondent is brief in his reference to the duty of the Government in the matter of preserving the public domain. He says: "Stop sale of lands except to actual settlers, and hang timber thieves."

WOODBURY COUNTY.

It is estimated that nearly 6 per cent. of the area of this county was originally in timber, principally cottonwood. There were some hard woods, but of no great extent or value. Fully 20 per cent. of the original supply has been cut, mainly for fuel, although considerable cottonwood has been taken for lumber. The planted forests on the prairies are, perhaps, twice the area of the original timber. The spontaneous growth is equal to the original in extent and of superior quality. Planted forests are largely of the soft-wood varieties. The hard woods are being planted more of late, and giving good satisfaction. Referring to the duty of the Government in the matter of preserving the public domain, an intelligent correspondent says: "Repeal the present timber act and pre-emption law, and place all Government land under a homestead law, requiring at least 10 acres of timber planted on each quarter-section, and to be in good growing condition at the time of final proof."

WORTH COUNTY.

Nearly 20 per cent. of this county was covered with hard woods of more than fair quality when settlements were first made. Seventy five per cent. of this has been cut, a large quantity to gain land for tillage, and the balance for fuel and fencing. Growing forests, planted and spontaneous, will not supply one-eighth the demand. The correspondent recommends the "repeal of the timber act, and require all homesteaders to plant a specified number of acres before perfecting title."

Lumber production of Iowa.

BOARDS AND OTHER SAWED LUMBER.

County.	1882.	1883.	Increase.	Decrease.
Appanoose	150, 214	212, 106	61, 892	.....
Allamakee	8, 212, 412	12, 011, 201	3, 888, 789	.....
Buena Vista*	.....	.....	.....	.....
Black Hawk	50, 000	60, 000	10, 000	.....
Chickasaw	1, 424, 612	1, 526. 410	101, 798	.....
Clayton	15, 850, 000	15, 050, 000	.....	800, 000
Clinton	120, 024, 000	107, 027, 000	.....	12, 997, 000
Davis	270, 000	305, 000	35, 000	.....
Des Moines	17, 200, 000	4, 250, 000	.....	12, 950, 000
Dubuque	41, 107, 760	32, 103, 178	.....	9, 004. 582
Decatur	1. 050, 000	800, 000	.....	250, 000
Floyd	412, 204	175, 604	.....	236, 600
Fremont	212, 496	210, 283	.....	2, 213
Fayette	150, 000	250, 000	100, 000	.....
Henry	1, 422, 141	821, 436	.....	600, 705
Iowa	75, 000	50, 000	.....	25, 000
Johnson	50, 000	100, 000	50, 000	.....
Jackson	5, 438, 980	5, 607, 570	148, 590	.....
Jones	1, 051, 330	1, 348, 504	297, 174	.....
Lee	38, 550, 771	34, 639, 048	.....	3, 911. 723
Muscatine	32, 750	30, 000	.....	2, 750
Poweshiek	37, 020	35, 095	.....	1, 925
Scott	14, 030, 500	15, 026, 500	996, 000	.....
Tama	225, 408	300, 204	74, 796	.....
Woodbury	1, 500, 000	1, 200, 000	.....	300, 000
Wapello	800, 000	670, 000	.....	130, 000
Total	269, 257, 598	233, 809, 139	5, 764, 039	41, 212, 498

Lumber productions of Iowa—Continued.

LATHS.

County.	1882.	1883.	Increase.	Decrease.
Appanoose*				
Allamakee	1,500,000	2,000,000	500,000	
Buena Vista	20,000			20,000
Black Hawk*				
Chickasaw*				
Clayton	3,500,000	3,250,000		250,000
Clinton	17,004,566	16,506,000		498,000
Davis*				
Des Moines	4,500,000	5,900,000	1,400,000	
Dubuque	4,524,825	27,665,000	23,140,175	
Decatur	50,000	50,000		
Floyd*				
Fremont*				
Fayette*				
Henry*				
Iowa	50,000			50,000
Johnson*				
Jackson	1,341,300	1,643,000	301,700	
Jones*				
Lee	9,324,850	8,342,500		982,350
Muscatine	99,000	8,500		500
Poweshiek*				
Scott	10,296	9,700		596
Tama*				
Woodbury*				
Wapello*				
Total	41,334,837	65,374,700	25,341,875	1,802,012

* No report received.

SHINGLES.

Appanoose *				
Allamakee	1,000,000	1,500,000	500,000	
Buena Vista	25,000			25,000
Black Hawk *				
Chickasaw *				
Clayton	5,000,000	5,500,000	500,000	
Clinton	35,007,901	41,100 000	6,092,099	
Davis *				
Des Moines	14,000,000	12,500,000		1,500,000
Dubuque	16,681,750	14,702,950		1,978,800
Decatur *				
Floyd *				
Fremont *				
Fayette *				
Henry *				
Iowa	30,000			30,000
Johnson *				
Jackson	148,590	601,000	452,410	
Jones *				
Lee	25,469,000	21,700,000		3,769,000
Muscatine	10,500	10,000		500
Poweshiek *				
Scott	10,482	9,300		1,182
Tama *				
Woodbury*				
Wapello *				
Total	97,383,223	97,623,250	7,554,509	7,304,482

* No report received.

MINNESOTA.

There are seventy-nine counties in this State. Seventy-one circulars of Form A were sent to Department correspondents, and twelve to individuals of personal acquaintance. Forty-five responses were received. To mill-men, sixty-four circulars, Form B, were sent, and ten to individual acquaintances. Thirty-four replies were received. There should have been more responses from this important territory. The returns, however, will enable the compiler to closely approximate the whole.

It will be seen there was an increase from 1882 to 1883, in boards and other sawed lumber, of 27,060,183 feet; 2,134,000 laths, and 272,750 shingles.

There seems to be no fixed or general idea as to preventing forest fires, or encouraging timber growth. A large number of correspondents say cultivation and putting down to grass for grazing are the best preventives of fire. Enforcement of existing law is generally demanded in the matter of preserving forests on the public domain.

Among many correspondents there is a feeling akin to Fourierism, or Communism, if that comparison be permissible; that is to say, the land should be held or owned in common by the people who settle upon it. They express the feeling that the Government is disposed to bear down on the people and favor the larger interests of corporations or syndicates.

ANOKA COUNTY.

About three-fourths of this county was originally wooded land, not, however, of great value as timber. There were a few good white oaks, of which more than half has been cut, the remaining supply being maple, elm, and basswood. Much of the land cleared has been used for agricultural purposes. All timber cut has been utilized principally for fuel. The natural growing supply will, it is thought, fill about one-fourth the place of that cut. No artificial planting, except for ornamental uses, has been done.

BECKER COUNTY.

This county originally was about one-third in heavy timber, one-third being groves alternating with prairie, and one-third clear prairie. Very little clearing has been done. Where cut, especially for lumber, the area gone over has simply been culled. The uses have been largely for lumber, telegraph poles, and railroad ties. In one or two timber townships land to some extent is occupied by farmers. They have cleared up from ten to forty acres each. About all the good pine and oak has been cut for the uses indicated, the remainder being principally oaks, maple, poplar, birch, elm, ash, small pine, and tamarack. The young, natural growth is not keeping pace with denudation; it only appears on ground culled over. There is no new, spontaneous growth. In the prairie portion of the county some attention is being paid to timber-culture. Quite a number of timber claims are made and improved in addition to other planting. In the region where timber and prairie alternate, fully 50 per cent. of the timber has been destroyed by prairie fires reaching into the groves.

BENTON COUNTY.

It is estimated that two-fifths of the county area was originally in timber, and one-tenth of that has been cut. The varieties were oaks,

soft maple, ash, basswood, and aspen. The oaks are of fine quality, and compose about one-third the whole. The correspondent divides the land cleared into thirds, of which about equal parts were cut for agricultural uses, lumber, and fuel. Timber can be planted and grown to advantage, but nothing is being done in that direction. In early days fires reduced the forest area fully one-fourth, but for the past ten or twelve years no fires have occurred.

BIG STONE COUNTY.

Nearly all this county is prairie, not over 500 acres having been in original timber, and that in small patches scattered promiscuously. Substantially all has been cut off, or, rather, cut over for fuel. The area of young, spontaneous growth is now much larger than the original. Where prairie fires are repressed and kept from sweeping the entire county new timber generally shows itself. Tree-planting, while not receiving the attention it should, is taking a good hold, and increased interest may be expected. Soft woods are being planted principally, but hard woods flourish where introduced.

BLUE EARTH COUNTY.

It is estimated there were originally about 100,000 acres of timber land in this county. It has not been cut to any great extent. The varieties are mostly hard woods—oaks, hard maple, ash, &c., with some cottonwood and soft maple. Most of the best varieties has been cut for lumber, but the principal use was for fuel. There is an increase of natural forests, but few farmers are planting trees.

BROWN COUNTY.

About one-tenth of the county area was in timber, situated along the Minnesota and Big Cottonwood Rivers, and the lakes. All the good timber has been cut. The varieties were ash, black and white walnut, hard and soft maple, elm, and cottonwood. The timber taken has been used for building and fuel. Young timber comes up quickly on cleared grounds, and, when well cared for, gives great promise. There is a growing interest in tree-planting; considerable has already been done of soft woods.

CARVER COUNTY.

This was called a timber county, but fully one-sixth of the area is marsh land. Perhaps 50 per cent. of tillable lands are under cultivation. The varieties of timber are not given. It has been and is being cut mainly for fuel, and shipped to Saint Paul. The cord-wood trade is a large one. In ten years more, the correspondent says, all the old supply will be gone. No new forests are being planted, but spontaneous growth comes on rapidly where the old trees have been cut out. The area of natural growth is thought to be increasing.

CHIPPEWA COUNTY.

This is a prairie county, except along the streams. There were about 5,000 acres of timber originally, about half of which has been cut for fuel and fencing. None of the land cut over of any consequence, has been put to agricultural uses. It comes up again in young timber. There

is a general disposition to plant trees on the prairies, and much of it is being done. Those experimenting find that the yellow cottonwood, from the Missouri River, has, strange to say, been winter-killed, and they prefer the white ash; maple, box-elder, walnut, elm, and catalpa are being successfully planted. The oaks are planted to a limited extent, and doing well.

CHISAGO COUNTY.

The whole county was called timbered, and yet reports show that at least one-third of the area consists of what is known as "openings," or alternate groves and prairie. The other two-thirds was well clad in excellent hard woods—oak, hard maple, poplar, birch, tamarack, elm, and basswood. The cut was for lumber, fuel, &c., and most of the cleared land used for agriculture. Before the days of railroads, much timber was burned in clearing the land. There are no young growing forests to take the place of the old.

DAKOTA COUNTY.

This is termed a prairie county, and yet the correspondent thinks from one-third to one-fourth of the area was originally covered with a rather inferior grade of oak, poplar, elm, hackberry, maple, and basswood, which was cut principally for fuel. Some of the best timber in bottom lands has been cut for lumber. There is no forest-tree planting, and growing forests of spontaneous origin will not supply the demand for fuel alone. The correspondent planted 1,000 of the European larch eleven years ago, 4 by 4 feet apart. Most of these are now large enough for fence-posts. The conditions are favorable for growing forests in this county.

DODGE COUNTY.

Nearly or quite half this county was originally in woodlands—oaks, elm, basswood, hackberry, black and white walnut. Probably half the timber land has been gone over and culled, where lumber timber was sought. When the object was to obtain fuel, the cut was cleaner, and where the land has not been put in use for agriculture, the new growth is promising. Taking all in all, there is now more timber than the original supply. Nearly all farmers are doing something toward planting groves, principally of soft woods. The new growth, both spontaneous and planted, is considered better in quality than the old. The old growth had been damaged by invading fires, while the new has been protected in this respect. The correspondent intelligently refers to the query relating to the duty of the Government in the matter of encouraging and preserving forests, by saying, in substance, "The General Government should set apart one section in each organized county, under management of the county authorities, as an experimental farm or station, and largely devoted to forestry."

DOUGLAS COUNTY.

This county was originally about equally divided between timber, water, and prairie. The timber land consisted of some good oak, hard maple, and poplar, the more inferior varieties being elm, birch, and basswood. Much of the soft woods is used for manufacturing purposes, but in what direction is not stated, but 10 per cent. of all the timber has been consumed for various purposes. Small portions of the timber land have

been cleaned up and used for agriculture. A new growth comes on very quickly in place of the old, and the natural timber area is said to be increasing. Some tree-planting is being done, but none of the better varieties. Timber can be grown without difficulty.

FARIBAULT COUNTY.

The correspondent speaks for Faribault and the adjoining counties on the east and west, Martin and Freeborn. About one-eighth the area of these counties was originally timbered. Probably seven-eighths of the original supply has been cut. The uses of timber have been lumber, fencing, and fuel. That remaining is burr and black oak, ash, and elm, all of more than fair quality. The land from which timber has been cut, when left undisturbed, comes up quickly in new and promising growth, much more dense than the original. Scarcely a farmer is without a well-cared-for grove of from 10 to 20 acres; some more than this.

FILLMORE COUNTY.

About one-fourth the county was originally forest, with quite an extent of "openings"—alternate groves and prairie. But little of the forests proper have been cut. The "openings," in many instances, have been cleared for agricultural uses, and the timber cut used almost exclusively for fuel and fencing. There are many new groves of young timber, showing where fires have been kept out. The new growth appearing since the first settlements is already large enough for many uses. Altogether there is ample supply of timber for all practical purposes—for generations, perhaps for all time—but there is no tree-planting. Little damage has occurred to forests by fires. "Timber should be cut when in full vigor, if the best properties are desired," says the correspondent.

HOUSTON COUNTY.

Originally about three-fourths of the county area was covered with timber, good of the varieties, which were, on uplands, principally oaks, red, burr, and white, and on lowlands, elm, soft maple, birch, and ash. Sixty per cent. has been cut, largely for steamboat and other fuel, fencing, railroad ties, piles, and hard-wood lumber. Very little has been cleared for agricultural use. All cuts have been utilized, and none wasted. Growing forests will more than fill the place of the timber cut, and are better in quality. In this county there are steep hill-sides, about four townships in extent, which could be profitably planted with timber. No attention, however, is given to forest-tree planting.

ISANTI COUNTY.

When first settled thirty years ago, this county was well covered with valuable timber. One-third has been cut, including all the valuable white pine, white oak, and hard maple. That remaining is black-oak and tamarack, fit only for fuel. The great and leading use of timber cut has been for lumber, railroad ties, and posts. Very little young timber of the natural growth remains; fires have run through so often, about all is destroyed. A goodly portion of land has been cleaned up and used for farming. The correspondent is of opinion that white pine can be reproduced without trouble. He himself planted this variety twenty-

two years ago, which now measures 36 inches in diameter, 2 feet above the ground. No one, however, seems inclined to invest in that direction while more ready realizations are presented. As to age of deterioration of trees, the correspondent thinks, "One hundred years for white pine and white oak, and one-fourth that for spruce and tamarack."

JACKSON COUNTY.

Not over five per cent. of the area of this county was originally in timber, and that principally of soft woods. The land has all been cut over and culled, the older and best timber being taken, the smaller growth remaining. As the land has not been cleared up for agriculture, an increased young growth came on, and the area is greatly augmented by other spontaneous growth. The timber cut has been partly used for lumber, but principally for fuel and other domestic purposes. Farmers and others interested are planting young groves of timber liberally and meeting with success.

KITTSON COUNTY.

One-twentieth of this county, it is estimated, was timbered, and perhaps one-tenth has been cut. That cut was used for fuel. "There are no forests except what nature planted," says the correspondent. He is exceeding brief in all matters, and thinks tree-planting could be made a success, but no one is attempting it, except for ornamental purposes.

LAC-QUI PARLE COUNTY.

Not over one per cent. of the area of this county was formerly timber or wood land. The varieties were not valuable, being principally cottonwood, elm, box-elder, soft maple, and basswood. About half the original supply has been consumed for fuel. The young growing timber is more than filling the place of the old. Very many trees have been planted; they are doing well, and growing rapidly. Prairie fires "breaking over" into timber belts have done considerable damage.

LAKE COUNTY.

This is a rough, bluffy county, and but little ever has or will be accomplished agriculturally. It was originally covered with a dense growth of white and yellow pine, Norway spruce, white cedar, tamarack, white, yellow, and black birch, balsam, black and mountain ash. The cut has been exclusively for lumber, but is comparatively small. A large portion of the native forest is yet standing. No other facts are reported.

LE SUEUR COUNTY.

This county was originally nearly all timber. Three-fourths has been cut and the land cleared. The timber remaining is hard and soft maple, basswood, black and white walnut, elm, and ash. Formerly the land was cleared for agricultural uses, and the timber burned to get it out of the way. Latterly, the cut is more for lumber, fuel, and domestic purposes. The young, spontaneous growth is not over half that of the original still standing. The outlook for new growth is not encouraging, as most of the land cleared is in cultivation. There is no planting trees for forest purposes. In early days forest fires were very destructive, but of late none have occurred worthy of record. The correspondent

says "there is much swamp land in the county that could be drained somewhat and put in timber to good advantage." He further adds: "What is said of Le Sueur County may be said of Warren County."

LYON COUNTY.

A small timber area originally existed in this county—not over 3,500 acres in all, and that of no great value. About all is cut off for fuel alone. The land cut over has all come up in a better growth than the original, and reached out from the borders, until now there is quite an increase of area. There is an extraordinary tree-planting disposition in this vicinity, and valuable varieties of timber are being planted—oaks, black walnut, ash, elm, maple, and box-elder. The future is considered usually encouraging.

M'LEOD COUNTY.

This county was originally about one-half covered with wood. Forty per cent. has been cleared off; that left is oak, elm, basswood, aspen, ash, and maple. Twenty per cent. of the land cleared has been devoted to agricultural use, and 10 per cent. destroyed by fire. Growing forests will not supply over 5 per cent. of timber cut and destroyed. New groves have been planted quite extensively on the prairies, and grow rapidly. Where land has been cut over and left undisturbed a new, spontaneous growth takes the place of the old. The correspondent estimates the maturity of trees—oaks and ash, at 75 to 100 years; elms, 40 to 60; and basswood from 60 to 70.

MEEKER COUNTY.

The correspondent includes McLeod with Meeker County, and while not furnishing the original area, estimates 60 per cent. of the timber of both counties as having been cut off, at the outset, for agricultural use exclusively. For the past ten or twelve years the cut has been for logs and railroad ties. There are no growing forests outside the original area, except as a few enterprising farmers are leading out in that direction. No fires have occurred within the past ten years. "Laws amount to nothing in the matter of preserving and protecting forests," says a correspondent. "The people must be educated up to a practical standard."

MORRISON COUNTY.

Five-sixths of the original area of this county was covered with timber—elm, pine, oak, tamarack, maple, birch, basswood, ash, and poplar. One-tenth or more has been cleared off and used, principally for lumber. Perhaps one-thirtieth has been cut for fuel and to obtain land for agricultural purposes. The amount cut at present is more than double the new natural growth. No efforts are made to plant timber, other than for ornamental uses. Timber can be grown to advantage artificially. The young wood growing naturally is estimated at about one-hundredth of the area of the county. One-fiftieth of all timber in the county has been destroyed by forest fires, occasioned, in the main, by clearing out the best timber, trimming it up, and leaving *débris* to be caught by the first spark. To increase and preserve forests a correspondent suggests, in substance: "Timber land, when sold, should be sold by stumpage, not acreage. All prairie land should be required to be planted, a stipulated acreage to each tract, before passing title.

MURRAY COUNTY.

There were originally not over 300 or 400 acres of timber in this county, but of good quality, principally oaks and white ash and some elms and basswood. About all of sufficient size have been cut for fuel. Long before any settlements were made in this county there was a valley of very valuable timber, known as the "last timber," which was all plundered. This land, where not in use for farms, has grown up with young timber of valuable promise. But little effort has thus far been made in artificial timber production. Lombardy poplar, soft maple, box-elder, cottonwood, and willow only have been planted, and have done well.

NICOLLET COUNTY.

The correspondent speaks for Nicollet County, Brown, on the northwest, and Renville on the north, adjoining counties. All these are "prairie districts," with about one-twentieth in timber of rather inferior quality, and which has been well nigh all cut for lumber, railroad ties, piling, fuel, and other domestic uses. The varieties were red oak, hard maple, basswood, red and rock elm, oak, and cottonwood. The denuded portions have not only been rehabited, but the area of natural growth is largely increased. There is a growing disposition to plant trees, and the prospects are that these counties will have an abundance of timber in the near future for at least all home demands.

NOBLES COUNTY.

This county is about as exclusively prairie as any other in the State. There were not 40 acres of any kind of timber originally in it, and still there is comparatively but little attention paid to planting forests. A few enterprising farmers have planted with success. The advantages are good, and it is believed more interest will, in the near future, be taken in forestry.

NORMAN COUNTY.

This county was originally well covered with timber, not of any great value, except the poplar.

The other varieties were, ash, elm, cottonwood, box-elder, basswood. Five per cent. has been cut, principally for fuel. Poplar has been, and is being, used for paper pulp. Growing timber is fully equal to the cut. As shown by experiment, there is no trouble to grow timber by artificial process. The correspondent expresses himself as follows in relation to preserving and encouraging forests on the public domain: "If the General Government would deal as harshly and strictly with corporations, mill-men, and timber thieves as it does with the settler, there would be less need for anxiety in the matter."

OLMSTED COUNTY.

The greater portion of Olmsted County is prairie. More than one-half the original forest is cut off, and the land converted into grain fields. The varieties of timber remaining are oak, maple, ash, basswood, and aspen, indicative of the original growth. The timber cut has been generally utilized for domestic purposes. As coal is now largely employed, there will be less demand for wood fuel. Where twenty years ago there were only brush patches, valuable young groves

of promising timber are now seen. The new supply of natural growth, under existing circumstances, will more than meet the home demand. No attention of consequence has been given tree-planting for forest purposes.

POPE COUNTY.

Only about one-tenth of the county area was originally in timber. One-tenth or more of that has been cut, principally for fuel. The varieties were oak, ash, maple, poplar, hackberry, basswood, cottonwood, and box-elder. The quality of that remaining is only fair, not good. Very little of the land has been cleared up, but simply culled. Wire fencing being now almost universally in use, there is, comparatively, no demand for timber in that direction. The young natural growth will more than take the place of that cut; beside, much attention is being given tree planting, and with gratifying success thus far, principally of soft woods. The correspondent says: "The better mode of propagating timber on lands once cleared, is to depend on sprouts coming up from the stumps. Clear off all but one, and it is astonishing how soon we will have a large tree fit to cut again."

REDWOOD COUNTY.

Indian tradition claims that this county, in very early days, had about 12,000 acres of timber. It is now, and has been since the first settlements, denominated as part of the "treeless regions." There is no timber, except about the lakes, although the young, natural growth is promising. In addition, farmers are generally planting groves, but mainly of the soft woods. Some walnut is being also planted.

RICE COUNTY.

Originally, 50 per cent. of this county was in oaks, maples, basswood, and elms, and one-half, it is supposed, has been cut. One-third of this has been cleared up for agriculture, and the balance taken for fuel and lumber. That remaining is in good, healthy, growing condition. The new natural growth is thought to be in excess of the original. This, however, is not being cared for as it should be. There is no tree-planting for forest use.

SCOTT COUNTY.

About one-half the county was originally in hard and soft maple, red, black, and burr oak, elm, ash, and basswood. Seventy-five per cent. of this has been cleared off and used for the general purposes of lumber, fuel, fencing, building, &c. In some instances, where land was cleared for agriculture, the timber was burned to get rid of it. There is a good showing of young growth, but the second production in this region differs in variety from the first. The possibilities of timber-planting are good, but nothing has been done in this direction.

SHERBURNE COUNTY.

This is a prairie county, interspersed with a few "oak openings," and one small body of fair, heavy wood. What cutting has been done was for fuel and fencing. Some brush lands have been cleaned up for agriculture. Strange to say, no effort as yet has been made to plant timber even where it is so much needed and so readily propagated.

SIBLEY COUNTY.

This county, settled in 1852, was originally well timbered. In the townships bordering on the Minnesota River the land is principally owned by residents who are interested in farming. Here timber is better cared for and preserved; elsewhere the "cutting and stacking" policy prevails, and a few years will find the county destitute of any valuable timber. The timber cut has been used for nearly all purposes; and where land was needed for agriculture timber was simply destroyed to get rid of it. There are a few timber claims in the county, and quite an interest is manifested in tree-planting, notwithstanding the large original supply. A planted grove of 28 years shows diameter of trees as follows: White oak, six inches; black oak, twelve; ash, twelve; elm, fourteen; linden, sixteen; soft maple, twenty; aspen, ten; cottonwood, forty-four. About twenty years ago, a destructive fire burned much of the timber then growing. The correspondent thinks "cottonwood should be cut at twenty-five years; soft maple at forty, and hard maple, elm, linn, black and white walnut at fifty." He speaks of new timber.

STEARNS COUNTY.

About one-sixth of the county is covered with timber and brush or undergrowth. Probably one-half this area is of fair timber, such as oaks, ash, poplar, and elm. The area of young spontaneous growth has largely increased since fires have been kept in subjection. There is a prevalent opinion that the county, "beyond the memories of the oldest inhabitants," was once a dense forest, afterwards destroyed by aboriginal fires. This opinion is based on the fact that everywhere, where fire is kept out and the land undisturbed, new forest growth quickly appears and flourishes. There has been some timber cut for lumber and railroad uses, but principally for fuel. On prairie lands fair attention is being given to tree-planting, and with success. The correspondent estimates there are now 40,000 acres more of growing timber than when the county was first settled.

STEVENS COUNTY.

This is, and has always been, substantially, a treeless county. Sixteen townships, with a total area of 357,120 acres, show timber in small groves near the lakes, the varieties being burr oak, basswood, willow, box-elder, and cottonwood. That cut has been used for fuel. Much attention is given to planting, and where trees are well put out and cared for, the best success follows. To use the correspondent's own language: "My own opinion is, that a crop of trees can be grown as surely, and in proportion to its value, with less expense than a crop of corn, and that 10 acres, properly planted to timber, and well cultivated and cared for, will, in eight years, supply fuel in abundance for the family, and fencing for a farm of 160 acres."

WABASHA COUNTY.

One correspondent contents himself with replying only to the query: "What should the General Government do for the preservation and increase of forests on the public domain?" The following is his answer verbatim: "Educate foresters as it does soldiers. Put an army of them to growing trees on public lands. When lands are sold, charge the cost

to the purchaser. Forever forbid denudation of mountain and hillsides at source of streams, small or large. Wherever climatological science points the way to save the country relapsing into a desert, or to prevent the destruction of valleys by inundation, there follow and assert control—National, State, or Territorial."

WADENA COUNTY.

About two-thirds of this county was originally timbered; the best has been cut, mostly for railroad ties, and some good oak for lumber. That remaining is largely tamarack and aspen, with a mixture of "odds and ends." Very little land has been cleared for agriculture. The new growth comes in at once after the old is cut away. The aspen seems to take the ground where fires are kept out. From the reports there is no encouraging outlook for timber of any valuable character in this county.

WASHINGTON COUNTY.

Nearly all the county was originally partly or wholly covered with timber—poplar, maple, tamarack, and other soft and not highly valuable varieties. There were, however, some good oaks. All is largely cleared, and land used for agriculture. The cut was principally taken for fuel. There is no tree-planting, and the young growing forests will not supply one-tenth of the home demand.

WATONWAN COUNTY.

The area of this county is 432 square miles. Originally the forests comprised 1,359 acres, and no part of this has been cleared off. The whole has been gone over, however, and all the best cut out. The young growth remaining consists of oak, ash, maple, basswood, black walnut, elm, and cottonwood. The timber was used for lumber and fuel. The area of the young growth far exceeds the old, but does not of course compare in value at present. If, however, this young growth is cared for it will in time be more valuable than the first. The State pays a bounty for planting timber. The area of planted groves increases largely each year, the varieties being ash, maple, beech, walnut, mulberry, box-elder, and cottonwood. A State law imposes heavy penalties for prairie fires. "Forest laws," says a correspondent, "that would benefit one section of country might not benefit another. I do not understand how a general law can be provided."

WILKIN COUNTY.

This county did not contain originally "exceeding one acre of wood to each 160 acres of land." says a correspondent, "and about all has been cut or gone over." Young growing timber is about eight to one as of the original growth, principally in timber-culture claims. The varieties planted, as in almost all other localities, are extensively of soft woods, because of quick growth and realization. Hard woods do well, but being of slower growth, are more sparingly planted. Cultivation and grazing are considered to be the best guards against fires. A correspondent says he has raised oak and elm trees 3 feet in diameter 3 feet above ground, but he does not state the age. He thinks the present generation "would reap best returns in cutting young timber when 8 to 10 inches in diameter."

WINONA COUNTY.

This county embraces twenty townships, the north and east sides being contiguous to the Mississippi River. The bottoms were originally covered with good timber, oak, ash, maple, elm, basswood, birch, and cottonwood. Nearly all has been cut and used for lumber and fuel. Where land has not been put in use for agriculture but left undisturbed, a new and flourishing growth of the same varieties as the old comes up quickly. The original timber area would not exceed more perhaps than three or four townships. A goodly portion of the land cleared has been used for farming—wheat-growing particularly. Fires still run over the unoccupied districts yearly, and thus destroy the prospects of young timber. Some tree-planting is done, with gratifying results, and more will be accomplished as the people become educated up to a working interest. Referring to the causes and prevention of fires, a correspondent says: "Our laws are good enough. The loophole for avoiding penalties is the *intent*." And, further, as to the duty of the Government in the matter of protecting and increasing forests: "All stumpage laws should be repealed, and timbered lands unfit for agriculture should be withdrawn from homestead and pre-emption, and disposed of as States dispose of school lands."

WRIGHT COUNTY.

Three-fourths of this county was originally timber—oak, elm, hickory, maple, hackberry, ash, and some black walnut. About one-fourth the original stand has been cut and cleared, principally for agricultural uses, and the timber largely burned on the ground to get rid of it. Some timber has been cut for fuel, and the land left undisturbed. On this a new and promising growth has come up. There is no tree-planting for forest purposes.

Lumber production of Minnesota.

BOARDS AND OTHER SAWED LUMBER.

County.	1882.	1883.	Increase.	Decrease.
Aitkin	8,000,000	7,800,000	.....	200,000
Anoka	16,990,000	13,078,000	.....	3,912,000
Benton	500,000	.....	.....	500,000
Becker	2,000,000	1,500,000	.....	500,000
Crow Wing	5,000	5,000	.....	.....
Chisago	3,420,000	2,710,000	.....	710,000
Carlton	47,000,000	43,000,000	.....	4,000,000
Cass	1,440,000	2,050,000	610,000	.....
Dodge	546,000	598,000	52,000	.....
Douglas	182,000	130,000	.....	52,000
Fillmore	70,000	85,000	15,000	.....
Goodhue	4,000,000	10,000,000	6,000,000	.....
Houston	3,090,000	3,600,000	510,000	.....
Hennepin	120,590,000	120,599,000	9,000	.....
Isanti	150,000	250,000	100,000	.....
Kanabec	800,000	1,000,000	200,000	.....
Lake	1,250,000	1,250,000	.....	.....
Le Sueur	2,338,817	2,300,000	.....	38,817
Morrison	2,250,000	6,600,000	4,350,000	.....
McLeod	850,000	1,050,000	200,000	.....
Otter Tail	650,000	280,000	.....	370,000
Pine	9,500,000	12,400,000	2,900,000	.....
Rice	14,550,000	16,675,000	2,125,000	.....
Shorburne	2,300,000	3,700,000	1,400,000	.....
Sibley	1,020,000	850,000	.....	170,000
Stearns	4,436,000	5,809,000	1,373,000	.....
Saint Louis	41,000,000	52,000,000	11,000,000	.....
Todd	4,650,000	5,425,000	775,000	.....
Winona	85,538,000	84,691,000	.....	847,000

Lumber production of Minnesota—Continued.

BOARDS AND OTHER SAWED LUMBER—Continued.

County.	1882.	1883.	Increase.	Decrease.
Wright	1,580,000	1,790,000	210,000	
Wabasha	1,300,000	1,100,000		200,000
Wilkin	150,000	200,000	50,000	
Washington	53,219,000	57,000,000	3,781,000	
Ramsey	5,000,000	8,000,000	3,000,000	
	440,464,817	467,525,000	38,660,000	11,599,817

LATHS.

Aitkin	4,000,000	4,500,000	500,000	
Anoka	3,611,000	2,803,000		808,000
Becker	400,000	350,000		50,000
Chisago		100,000	100,000	
Carlton	6,500,000	6,800,000	300,000	
Cass	1,479,000	3,955,000	2,476,000	
Goodhue	200,000	300,000	100,000	
Houston	300,000	400,000	100,000	
Hennepin	20,061,000	21,173,000	1,111,000	
Rice	5,000,000	6,000,000	1,000,000	
Saint Louis	4,700,000	10,000,000	5,300,000	
Stearns	2,060,000	1,746,000		314,000
Todd	50,000	415,000	365,000	
Winona	31,563,000	29,901,000		1,662,000
Wabasha	700,000	500,000		200,000
Washington	27,712,000	21,628,000		6,084,000
	108,336,000	110,570,000	11,352,000	9,118,000

SHINGLES.

Aitkin	2,500,000	6,000,000	3,500,000	
Anoka	5,495,000	2,508,000		2,987,000
Becker	1,500,000	1,400,000		100,000
Chisago	1,000,000	900,000		100,000
Carlton	17,500,000	13,000,000		4,500,000
Cass	6,485,000	11,285,000	4,800,000	
Goodhue	1,500,000	4,000,000	2,500,000	
Hennepin	38,324,000	32,954,750		5,370,250
Morrison	800,000	800,000		
Sherburne	500,000	800,000	300,000	
Saint Louis	8,500,000	11,500,000	3,000,000	
Todd	750,000	795,000	45,000	
Winona	46,043,000	43,995,000		2,048,000
Wabasha	800,000	500,000		300,000
Washington	29,491,000	31,023,000	1,532,000	
	161,188,000	161,460,750	15,677,000	15,405,250

MONTANA.

The extent to which native forests have been cleared off in the early-settled counties of Madison, Gallatin, Beaver Head, Silver Bow, Deer Lodge, Missoula, Jefferson, Lewis and Clark, and Choteau, is perceptible only in the immediate vicinity of towns and smelting works. In the newer counties, settled within the past four or five years, since the construction of the Northern Pacific Railroad, there has been more demand, especially in Hellgate Cañon.

The kinds of timber left standing are principally of the coniferous species, with some black ash and scrub oak on the Lower Yellowstone, but none of commercial value. The valuable timber of Montana con-

sists of white and yellow pines, white cedar, and tamarack, which grow to enormous size on the high mountains west of the Rocky Mountains; also Douglas fir and hemlock. All forest growth on the Pacific slope in Montana is much larger than on the eastern slope, consequent upon certain well-known climatic causes. In size, growth, and other characteristics Montana forests partake of the types of Oregon and Washington Territory, while the same varieties on the eastern slope resemble their congeners of the Atlantic slope or coast.

None of the valleys on the eastern slope, it may be safely said, were ever covered with timber. A narrow fringe of cottonwood, quaking aspen, and alder is found on the margins of all streams, seldom extending farther than one-quarter to one-half mile back from the banks. These are used for fuel, fencing, barns, and log houses; at best they are inferior for any purpose. No timber is found on the prairies or plains embraced in the counties of Choteau, Dawson, Meagher, Yellowstone, and Custer. Some of the valleys west of the main range of the Rockies are partially covered with an excellent growth of pine, viz, the Big Blackfoot, Hellgate, Bitter Root, and nearly the whole region in Missoula County south and west of Flat Head Lake. Nearly all the mountain ranges, spurs, and detached clumps, Crazy Mountains in Gallatin County, Bear Paw, and Little Rockies in Choteau County, are covered with timber. West and north from the southern boundary of the Territory timber on all the mountain sides increases in size and density. The largest and best growths are where snow remains on the ground longest.

From reliable data, it is safe to estimate that of the 146,000 square miles embraced within the boundaries of Montana, 40,000 square miles are covered with valuable forests. The best and most valuable are found on the western side of the Rocky Mountains and along Bitter Root Mountains.

Thus far all timber cut in Montana has been for domestic uses and lumber, fuel, building, railroad construction, smelters, quartz-mills, fencing, corrals, &c. The informant states:

> Not an acre has been cleared to make a farm. When timber is cut off the mountains, crops cannot be grown, for want of water. No crops can be grown on the mountainous regions without irrigation. The valleys along streams are rich, and produce duce good crops without irrigation.

Colonel Wheeler supports the theory, heretofore advanced, as to the importance of spontaneous growth, or nature's successful efforts to reproduce and rehabilitate timber denuded regions. He says:

> On the mountains, where timber has been cleared off or destroyed by fire, a new growth at once springs up, and begins restoration. I know of many places where timber was cut away or destroyed by fire, fifteen years ago, which now have dense growth, ranging from twelve to twenty feet in height.

This young growth will, if protected, produce in time forests equal to the original. This is the only young timber growing in Montana. Some grows naturally on the prairies, as in the valleys.

From the United States Land Office it is learned that since the passage of the timber-culture act 826 claims have been filed in the Helena district, fully one-half since January last. None have yet been perfected. Many of these claims are filed by those who are homesteaders or pre-emptioners, and made simply to hold, and at convenient seasons the timber claim is abandoned and lands appropriated to other purposes.

There are differences of opinion as to artificial timber culture in Montana. Enterprising men have faith and are experimenting. A few years will determine the matter to some extent.

In 1869 and 1883 forest fires were very destructive in Montana and the Pacific coast generally. More good timber has been thus destroyed than could be consumed by the people there for generations. The seasons named were excessively dry. There was no rain from June to September. Tourists, hunters, prospectors, Indians, and everybody who camped out were careless. Fires generally burn over large tracts of country before arrested by intervening streams, rain, or snow-fall. Territorial laws provide severe penalties for fires in forests, or neglect of camp fires; but the difficulty is in detecting and convicting.

In reply to the question, "What should the General Government do for the preservation of forests on the public domain?" Colonel Wheeler suggests:

> Appoint forest agents or inspectors, with such compensation as will secure honest, competent men, with a tenure of office during good behavior. Their vigilance would effectually warn campers and prevent illegal destruction of timber. One million dollars will not compensate for the loss of timber by fire the present year. A half dozen agents or inspectors would have saved the greater portion of this immense loss.

He further adds:

> Sell timber lands to individuals only in lots of 160 acres, and in sections to mill companies. They would take better care of the timber than the General Government can or will.

Montana has not been settled a sufficient length of time to determine satisfactorily the deterioration in value of trees. Pines, firs, and white cedars, 10 feet in diameter and 200 feet high, are still growing as vigorously and apparently as healthfully as they ever were. Some cut down show 500 and more annual or concentric rings. Where not destroyed by fire forests exhibit little, if any, signs of decay.

I have before me the Territorial conditions in the published report for 1882, showing 65 saw-mills in the Territory, cutting that year 26,184,000 feet of lumber. This does not reckon laths and shingles. Since the construction of the Northern Pacific and the extension of the Utah and Northern Railroad Companies there has been a greatly increased demand for both mills and lumber. The auditor thinks it safe to estimate the mills for 1883 at 150, and their lumber products at 75,000,000 feet, in round numbers. Colonel Dodge, engineer of the Rocky Mountain Division of the Northern Pacific Railroad for the 152 miles from Livingston, on the Yellowstone, to the mouth of the Little Blackfoot, reports 6,000,000 feet made, in sawed lumber and round timber, for bridges, culverts, trestles, piling, &c., exclusive of railroad ties. From the mouth of the Little Blackfoot to Herron's Siding, 222 miles, to the western boundary of Montana, an additional proportionate amount of 9,000,000 feet has been used, being 15,000,000 feet for the 374 miles of road. The Park Branch Railroad, 52 miles, passing over a comparatively level country, with fewer streams or ravines, consumed 20,000 feet of lumber per mile for 466 miles, or 9,320,000 feet, making a total of 24,320,000 feet. There are 844 miles of main track of the Northern Pacific Railroad in Montana. This road used 2,640 ties to the mile, making 2,228,160 ties. Each tie will measure 35 feet, board measure. This would make a grand total, in ties alone, of 777,798,600 feet of lumber. This does not include side tracks. It is impossible to estimate the extent of timber consumed for all other purposes, such as fuel, fencing, houses, corrals, stables, &c. Furnaces and quartz mills are great consumers. They cut off all for their uses within reasonable hauling distance, and also for charcoal. The supply of coal is inexhaustible, from poor lignite to the most valuable bituminous. It is mined abundantly, and railroad locomotives use it extensively; smelters are experi-

menting with it. This removes all fear of ever experiencing a fuel famine in Montana.

Mill correspondents report as follows in reply to the question "What is the average number of logs required to make 1,000 feet of boards," from logs that "will square 6 feet, 30 to 40 feet in length," down to 8 to 10 logs, to make the 1,000 feet. The sizes range from 1 foot in diameter to 10 feet.

The varieties of timber chiefly used are pine, fir, cedar, hemlock, and tamarack, say, one-half pine, one-quarter fir; cedar, hemlock and tamarack, about equal proportions, cedar predominating.

There are no reports or information respecting insect depredations.

NEBRASKA.

As no complete or official report has heretofore been made the present one dates from the extinquishment of the Indian title to lands, in 1854, up to and including the year 1883. At the date first named, what is now the State of Nebrasl.a was generally understood and supposed to be timberless. In fact, as fires annually swept over nearly the entire surface of the country, the supposition was substantially true, although along the Missouri River Valley, which stream courses the entire eastern border of the State, where the bottom lands are on the Nebraska shore, there existed a narrow strip of valuable and well-matured varieties of timber—oaks, black walnut, pecan, the ashes, elms, hackberries, red cedar, honey-locust, sycamore, soft maple, box-elder, willows, yellow and white cottonwoods; principally, however, the cottonwoods.

In the valleys of the Platte, Republican, Big and Little Blues, Big and Little Nemahas, Elkhorn, Running Water, Weeping Water, Bon, and other and smaller tributaries, a smaller and more recent growth was found of the varieties named in Missouri Valley, with hickories, lindens, Kentucky coffee tree, buckeye, and others of minor importance in addition. About the headwaters of the Running Water, in the northwestern portion of the State, a growth of pine (*Pinus strobus*) was found to quite an extent, and of sufficient size to be used for sawing into lumber, but too young and immature, however, to be of great value.

After a time, experience demonstrated that native seedlings transplanted into carefully-prepared soil did well on high uplands—out on the open prairie—not only did well, but grew with remarkable vigor and rapidity, showing characteristics of excellence in quality. To those of indigenous growth were added in time varieties of foreign origin: hard, or sugar maple, American chestnut, white walnut, poplar, beech, birch, black locust, larch, pines, catalpa, black cherry, and others. While success followed efforts in this direction, only the most sanguine, adventurous experimenters had faith in ultimate practical results. In further time, through an act of the Territorial legislature, creating a board of agriculture, the labors of the board organized under its provisions, and afterwards liberal legislative appropriations, keeping out annual fires, and other aids and precautions, tree growing in Nebraska is universally conceded to be a success. There is now no hesitancy or risk in predicting in the near future, that this region will be known and characterized as a timber-producing division of country.

EXTENT OF TREE PLANTING AND GROWING.

It may be safely stated that but little tree-planting was done, and, by reason of the annual fires referred to, spontaneous growth was exceedingly meager for at least ten years after the first settlements of the Ter-

ritory and the original efforts to improve and develop. From that time, and embracing the dates covered in this report—twenty-nine years—official statistics, with a few reliable estimates to cover dates not then provided, it is found there have been planted within the boundaries of what is now the State of Nebraska 248,496 acres of forest trees. This includes seedlings, seeds, and cuttings, planted in permanent forests, groves, and along highways and streets in cities and villages. Spontaneous indigenous growth, since fires have been kept from borders of streams and ravines, is estimated to be equal to half the area planted. Personal observation would warrant a larger proportion. Not a few informants contend for an equal extent; some higher—even to double. James T. Allan, of Omaha, ex-secretary of the American Forestry Association, traveling extensively over the west, responding to inquiries on this particular point, writes:

I have watched the spontaneous growth of young elms, walnuts, oaks, ash, hickories, &c., along the Missouri, Wood, and other rivers in the west, since fires have been kept back, and seen their growth among the hazel brush, which is the fringe on the border of native timber, dividing it from the prairie. I hardly think I am out of the way in setting it at double the amount of timber planted.

A majority, however, in various parts of the State, place the estimate, as stated, at one-half.

It is safe to say a majority of the planting is made originally 4 feet by 4, with a view to cutting out first one-half as growth demands space, and eventually another half of that remaining; three-fourths in all. Some plant 6 by 6; others 8 by 8. Planted 4 by 4, we have 2,622 trees to the acre; or a total of 651,556,512; 8 by 8, 682 to the acre; or a total of 169,474,272. Average the totals, and there is shown 410,575,392. Add to the average the spontaneous estimate, one-half, and the grand total planted in twenty-nine years is 615,773,088 trees. The number of trees per acre, spontaneous growth, will more than equal one-half the acreage planted. It is estimated one-fourth of the trees, seeds, and cuttings planted did not grow and therefore are not now occupying the ground. Spontaneous growth, except where the weak have been crowded out by the strong, and such as may have been destroyed by occasional fires, it may be said all are growing.

DEMONSTRATED USEFUL AND VALUABLE VARIETIES.

It has been practically demonstrated that the following valuable varieties of forest timber can be successfully and satisfactorily grown, both planted and of spontaneous growth. Only the most valuable are named in this list. Those designated with a * are indigenous.

ASH: *Fraxinus Americana.**
*viridis.**
*quadrangulata.**
*pubescens.**
*platycarpa.**
*sambucifolia.**

OAK: *Quercus alba.**
*obtusiloba.**
*macrocarpa.**
*prinus.**
*tinctoria.**
*rubra.**
*nigra.**

A dwarf chinquapin oak—*prinoides*—of shrub character grows in abundance, particularly on the bluff lands adjacent to the Missouri River, and in places in profusion on prairie lands, many acres in a body. It is a profuse bearer, the nuts being equal almost to chestnuts in

flavor. In early days it was considered a "Munchausen story" when old settlers told of hogs eating acorns from trees. The small growth, often not over a foot high, was loaded with nuts, and therefore easily eaten from by swine. Deer and antelope fatted on them.

BLACK WALNUT: *Juglans nigra.**
WHITE WALNUT: *Juglans cinerea.*
HICKORY: *Carya alba.**
*sulcata.**
*tomentosa.**
*porcina.**
*amara.**
PECAN NUT: *Carya olivæformis.**
ELM: *Ulmus Americana.**
*fulva.**
*racemosa.**
*alata.**
HACKBERRY: *Celtis occidentalis.**
HONEY LOCUST: *Gleditschia triacanthus.**
*monosperma.**
KENTUCKY COFFEE TREE: *Gymnocladus Canadensis.**
LINDEN: *Tilia Americana.**
SYCAMORE: *Acer pseudo-platanus.**
BLACK LOCUST: *Robinia pseud-acacia.*
SOFT MAPLE: *Acer dasycarpum.**
SUGAR MAPLE: *Acer saccharinum.*

Sugar maple is grown thus far for little else than ornamental purposes, lawns, and street trees. There is no reason why it may not be grown successfully for forest purposes, as it thrives well where introduced and planted.

POPLAR: *Liriodendron tulipifera.*
WILD BLACK CHERRY: *Prunus serotina.*
WILD RED CHERRY: *Pennsylvanica.**
HARDY CATALPA: *Speciosa.*
COTTONWOOD: *Populus monilifera.**
*heterophylla.**
WILLOW: *Salix purpurea.**
*cordata.**
*longifolia.**
*nigra.**

Valuable characteristics are noted of a willow growing spontaneously along the Missouri River, from the mouth of the Big Nemaha south, to the Yellowstone north, familiarly known as "diamond willow." Professor Sargent names it *Salix cordata* var. *vestita.* Experience demonstrates it to be as durable almost for underground uses, posts, &c., as red cedar. Northern Indians seem to have known of its valuable characteristics. They call it "twat," which, interpreted, signifies *durable.* It grows readily from cuttings, either in its natural home—the bottom lands—or out on high upland prairies.

BOX-ELDER: *Negundo aceroides.**
CHESTNUT: *Castanea Americana.*
PINES: *Pinus sylvestris.*
Austriaca.
strobus.
RED CEDAR: *Juniperus Virginiana.*
LARCH: *Larix Europæa.*
Americana.
MULBERRY: *Morus rubra.**
alba.
monetti.

Many varieties of less value than the foregoing, embraced in a complete sylva of the States, are here omitted, as not of practical value for forest pur oses.

GROWTH OF TREES.

The following actual measurements of tree-growths, of known ages, are given, showing circumference in inches, two feet above ground:

	Years old.	Inches.		Years old.	Inches.
White elm*	15	24⅜	Black walnut†	22	48
White elm*	24	63	Black walnut*	16	18
Red elm†	24	36	Black walnut*	16	50½
Catalpa*	20	48½	White walnut*	16	49½
Soft maple†	18	54½	Osage orange*	25	26½
Soft maple*	18	69½	Larch*	10	24
Sycamore*	16	43½	White pine*	20	36½
Pig hickory†	24	37⅝	White pine*	12	29
Shag-bark hickory*	24	30	Scotch pine*	15	23
Cottonwood†	23	78½	Scotch pine*	10	36
Cottonwood*	11	93	Austrian pine*	11	22½
Cottonwood*	25	98	Balsam fir*	12	26
Chestnut	14	24½	Red cedar*	12	26½
Box-elder†	14	25½	White cedar*	12	22
Box-elder*	14	31½	Mulberry*	18	43
Honey locust†	22	40½	Mulberry†	18	39½
Honey locust*	22	41½	Russian mulberry*	6	24
Kentucky coffee tree†	14	25½	Linden†	14	35
Burr oak†	22	36½	Poplar*	4	12
Burr oak†	26	43½	Silver-leaf poplar*	12	67
White oak†	22	29	Black locust*	24	60½
Red oak†	22	37½	Red willow*	20	58
Black oak†	22	38½	Grey willow*	15	26½
White ash†	22	32½	Yellow willow*	21	132
Green ash†	22	30			

*Planted. †Spontaneous growth.

No measurements are given as to height of trees, as all this depends on the distance apart they are planted. Isolated, they are low headed; close together, they run upward, as all well know.

ORDER OF VALUE.

The order in ultimate value of deciduous varieties, while there may be difference of individual opinions, it is safe to arrange as follows: White, burr, and chestnut oaks, black and white walnut, white, green, and blue ash, black cherry, catalpa, black locust, honey locust, Kentucky coffee tree, elms, hickories, larch, soft maple, hackberry, mulberry, cottonwoods, willows, box-elders. For present or near value, cottonwoods—especially the yellow—are almost universally conceded to be preferable. There are, as shown, two varieties, yellow and white—*monilifera* and *heterophylla*. The yellow makes excellent lumber, particularly for inside uses, not exposed to weather. For shingles only pine, cedar, or walnut are superior. Both make good fuel, after reasonable drying or seasoning. Old steamboat and mill men prefer half seasoned cottonwood to any other obtainable in this region, claiming they get more steam from it; much also is used in burning brick. No other wood holds nails so well. Recently the white cottonwood has attracted attention for use in manufacturing paper, the pulp from which is pronounced superior. This may some day become a feature in cottonwood culture.

Evergreens stand in order of value: Red cedar, white, Scotch, and Austrian pines.

ORDER OF PLANTING.

The order of preference in tree-planting, of deciduous varities, is, as near as may be, as follows: Cottonwood, box-elder, soft maple, elm, ash, black walnut, honey-locust, catalpa, oak, hickory, Kentucky coffee tree, black locust, larch, sycamore, hackberry, mulberry, black cherry, and willow. Two-thirds of all planted are cottonwoods, because they are more easily obtained, cost less, are of more rapid and certain growth, and realizations from them are more speedily and certainly secured, and in addition, they succeed almost anywhere.

Evergreens are planted in this order: Scotch pine, red cedar, white and Austrian pine.

Spontaneous growths range in order of value as follows: Oak (red and black, perhaps, predominating), hickory (more shagbark than others), black walnut, elm, linden, white ash, mulberry, and hackberry on the higher lands. On bottoms, cottonwood, box-elder, willow, sycamore, soft maple, green and water ash.

PRICES OF FOREST-TREE SEEDLINGS.

Prices of forest-tree seedlings are such as to place them within reach of the very poorest. In fact, as the great bulk planted are of spontaneous origin, they are to be had for the mere gathering in regions where found. When trafficked in, prices range, owing to variety and size (from six inches to four feet) all along from fifty cents to three dollars per thousand. Nursery-grown trees range higher in price. Many millions are now planted annually.

COST OF PLANTING.

This depends much on circumstances, the price of land, labor, varieties planted, skill in planting, and many other minor details. Cottonwood seedlings can be furnished in quantity from fifty cents to one dollar per thousand. Box-elder and soft maple, from one to two dollars. Oak, ash, walnut, hickory, catalpa, and chestnut from five to ten dollars. Robert Douglas & Son, Waukegan, Ill., are contractors for planting timber on the plains. The following is quoted from a letter on the subject:

We plant this section for the railroad company. They pay the actual cost of breaking and cross-plowing the prairie, which costs four dollars an acre. We prepare the land, furnish the trees, plant them four by four feet, and grow them till they are 4 to 6 feet high, and shade the ground till they require no further care or cultivation, and are to deliver two thousand trees 4 to 6 feet high on each acre, for which we receive $30 per acre. In taking contracts for the future we will charge $5 per acre for breaking and cross-plowing the land, as the cost of getting the teams together, seeing that it is properly done, measuring for the different plowmen, paying them, &c., is considerable, and actually stands us about $5 per acre.

Then labor has advanced since three years ago, so that we shall add $5 per acre, thus making, including breaking the raw prairie and everything till the trees are delivered over, $40 per acre, getting the $5 per acre at the time of breaking, $20 per acre when the trees are planted, and $15 per acre when they are delivered over.

When the trees are delivered over they are to be 4 to 6 feet, but most of them are much taller, and 2 to 2½ inches in diameter at the butt, perfectly free from weeds and not the least particle of danger from fires, as the catalpa leaves are very much like pumpkin leaves, and rot down. They need no pruning, as 100,000, four years planted, 10 to 15 feet high, are now shedding their under branches, or at least they are dead and will soon shed off.

I was to select land for another plantation when I was out last month, but the land that could have been bought three years ago at $2.80 per acre is now worth $12 to

$15 per acre, and on this account we concluded not to purchase. This would not make so much difference as it appears to, as the land will keep on increasing in value.

We think this a reasonable price, taking all the risks and care ourselves, and if any railroad companies or forest planting associations should undertake it, it would certainly cost more. Of course we would take the contract to plant without the further care, that is, $20 an acre for the trees and planting, or $25 if the prairie is unbroken.

This will afford an approximate estimate of cost where all is done by contract. Most planting, however, at present, is done by individuals for individual use, and when done by one's own labor and teams the cost is much less, at least the outlay.

ENCOURAGING ENACTMENTS AND PROVISIONS.

The Nebraska State constitution provides that "the increased value of lands, by reason of live fences, fruit and forest trees grown and cultivated thereon, shall not be taken into consideration in the assessment thereof." A State law "exempts from taxation for five years $100 valuation for each acre of fruit trees planted, and $50 for each acre of forest trees." The law also makes it obligatory that "the corporate authorities of cities and villages in the State shall cause shade trees to be planted along the streets thereof." Further, "any person who shall injure or destroy the shade tree or trees of another, or permit his or her animals to do the same, shall be liable to a fine not less than $5 nor more than $50 for each tree injured or destroyed." To encourage growing live fences, the law permits planting "precisely on the line of the road or highway, and for its protection, to occupy for a term of seven years six feet of the road or highway."

ARBOR DAY

originated in Nebraska through action of the State board of agriculture. It is a day designated by the board during planting season each spring, usually about the middle of April. The board annually award liberal premiums for the greatest number of trees, cuttings, and seeds permanently planted on that day. The governor, by annual proclamation, recognizes the day for the purposes indicated, urging the people to devote it exclusively to tree planting. It is very generally observed, and millions of trees are planted that day.

MODES OF PLANTING AND TREATMENT.

The usual distances apart are by multiples, 4, 8, 12, 16, &c. The intermediate ground may be utilized by being cultivated in other crops until the trees are of sufficient size to protect themselves, when, in farm parlance, they are permitted to "take the ground."

Most experimenters at first planted tree seeds where they were to remain permanently. Experience has shown this to be a mistake, for numerous reasons; principally, by this mode uneven stand, growth, grade, size, and vigor are to contend with. By planting seeds first in beds and, say, at one year's growth assorting, grading, and transplanting permanently each grade to itself, better results are secured. The same grades, as to size and vigor, do better together, and grow more evenly; the weak are not crowded out or overshadowed by the stronger, a practical illustration of the "survival of the fittest."

By this plan small plants, if healthy, do about as well in the end as the large. No variety is known not readily transplantable at one year old. Even varieties of tap-root characteristics—oak, walnut, hickory, and chestnut—are really better for tap-root pruning; by it, laterals, or

fibrous-feeding roots are induced. If larger sizes are desired before transplanting, root-pruning, by running a tree-digger under the rows and allowing them to remain a year or two longer, obtains good results. As a rule, however, better success is had by transplanting young trees, when, as near as possible, all roots are preserved. Small trees cost less to purchase, transport, handle, and transplant.

Alternating, especially certain varieties, has not given satisfaction. Trees, in some respects, are not unlike mankind, and will not fraternize. For instance, oak, walnut, and hickory will not fraternize with maple, cottonwood, and elm. When planted near each other the latter will invariably lean away from the former, assuming a crooked, gnarly appearance, and in the end virtually die out.

INCIDENTAL ILLS.

Thus far few ills have attended timber culture in Nebraska. The great losses or failures have been from careless handling and planting, and neglect afterwards. Black locust was planted extensively in earlier days, but being so badly affected by borers its cultivation until of late was almost entirely abandoned. The pest which almost universally destroyed it in the beginning suddenly and without known cause disappeared, and that valuable variety of timber is again receiving merited attention. In certain portions of Nebraska, during one or two years, a large nameless green worm stripped the leaves from most soft maples, for a time checking their growth. In a few instances the same borer attacking black locust injured soft maple and cottonwood to a limited extent. Being of such rampant growth the injury was not material. The trees attacked were principally used for ornamental purposes—those on streets in cities and villages. Where ground has been well and deeply prepared, good healthy plants used, care exercised in handling and planting, followed by attention and proper cultivation until able to care for themselves, there has been no good cause for complaint.

IMPORTANCE OF SPONTANEOUS GROWTH.

Too much importance cannot attach to spontaneous timber-growing. Nature, in this respect, is both accommodating and bounteous in her provisions. Waste places, as a rule, are utilized. Lands which if at all adapted to other uses, could only be prepared at extra expense, are those nature occupies and renders of value. This growth comes of its own accord, so to speak, without preparation or labor by man, other than to guard against fires, along broken and often precipitous bluffs and ravines, in nooks and corners of tortuous and meandering streams, incident to prairie regions.

A friend writing from the Republican Valley, 300 miles west from the Missouri River, says:

> Oak timber begins to be noticeable, and there are so many little burr-oak saplings creeping along up the hillsides that I marvel how they got there. This oak is strangely typical of the white pioneer of this section. At first there were a few scattering trees of large size along the banks of the streams where natural protection from fire enabled them to grow and spread their limbs in rugged strength and healthfulness. A few years more and bushes of the same kind sprouted up in sheltered nooks and dells and about the bases of the bluffs. Before these were high as a man's head, other germs of oak life broke through the sod further away from the parental stem. And so it went on, until now this sturdy tree promises to possess all uncultivated land, if spared by the ax. Here and there the brown verdure is relieved by a speck of green, denoting the presence of a clump of small cedars, or mayhap, a patriarch that escaped

the prairie fires of aboriginal days. These, sharply defined against the gray bluff or blue sky, and relieved by the brown and leafless arms of the oak or elm, make a dot of landscape that would secure immortality to the artist whose pencil could reproduce it with fidelity to nature.

As stated before, such spontaneous planting and growth stands and succeeds in far greater proportion than that of artificial processes. Losses are rare, and only from occasional invading fires; and where too thick on the ground the stronger kill out the weaker, there being no loss in fact, but simply adjustment or equalization.

It may be stated from personal knowledge that in many instances lands, twenty and twenty-five years ago considered worthless, have advanced in value from twenty to one hundred dollars per acre, solely because of the timber planted and grown by nature alone.

With few exceptions, the original timber growth or supply in Nebraska has long since been exhausted, and used principally for fuel. The trunks or bodies of the larger and better varieties were cut into lumber for building purposes.

The consumption of wood for fuel is decreasing, by reason of the coal-fields west of the State being more fully developed, and the demand in that respect is increasing.

Fires, which originally swept the country, strict vigilance being exercised, are of rare occurence, especially in the older and better improved portions.

Wood for fuel ranges in price at present date, for soft varieties, green, $2 to $2.50 per cord; dry, $3.50 to $4 per cord; hard woods, green, $4 to $4.50 per cord; dry, $5 to $6 per cord. The price of native lumber, soft woods, is from $16 to $20 per 1,000 feet; hard woods, from $35 to $60 per 1,000 feet; foreign lumber, principally pine, from $30 to $50 per 1,000 feet.

NATIONAL TIMBER ACT.

Justice to the west, where this act originated, and where most of the work under its provisions has been done, would seem to demand at least a passing notice, especially when so eminent a personage as Professor Sargent has publicly declared through the pages of the North American Review, October issue, 1882, the act to be a "disgrace to the statute books," "has not accomplished what was expected," "has given rise to gigantic frauds," "worthless as a means of forest growth," "encourages planting trees where trees cannot grow unless artificially irrigated, and thus entails losses upon honest settlers." Great personal regard for Professor Sargent, and high estimate of his ability and standing as a scientist, lead to the belief that he has made these assertions without proper consideration or reliable information. Facts known to myself, and many others in the west familiar with them, lead to different conclusions.

Brief reference is made to the professor's assertion relating to arid characteristics. Personal knowledge is had of over five hundred quarter sections of land, west of the hundredth meridian in Nebraska, where groves of from five to thirty acres are planted on each, and growing well without any irrigation whatever. This planting was done under the act, all growing well, and now 30 to 40 feet in height. One man in this "arid region" commenced planting in 1875, and now has 45,000 flourishing trees—maple, ash, walnut, box-elder and cottonwood, some 30 inches in circumference.

Since the passage of the national timber-culture act, 2,358,158 acres have been entered in Nebraska, under its provisions, as shown by official

statistics. The General Land Office books show 16,436 entries, or 164,360 acres planted, in detail as follows:

Year.	Acres.	Entries.
1873	21,858	137
1874	312,712	2,164
1875	130,894	1,061
1876	106,499	834
1877	90,812	706
1878	195,306	1,408
1879	465,968	3,188
1880	475,275	3,202
1881	240,306	1,662
1882	298,520	2,086

There may be frauds perpetrated under this act. It would be strange, rather than otherwise, were there none. Frauds are or can be perpetrated under almost any act and for any purpose. Those who know practically the workings of the timber act do not favor its repeal. It can, without doubt, be advantageously amended in certain respects, but as it stands, an incalculable amount of good has grown out of it, and will so continue.

NEVADA.

Quite an effort has been made to obtain data from this region, but thus far it has been attended with poor success. But fourteen blank circulars, Form B, were sent out, and but five responses were received. There were no Department correspondents. All the State officials, land officers, and such other officers as I thought of were addressed. In nearly all these latter instances responses were received, but none gave the information sought to any extent. From some personal observations made last year along the line of railroad, it is safe to say about the same condition of affairs exists in Nevada as in Idaho, perhaps more favorable, so far as timber supply is concerned. In many places there is a good supply, but it is used as extravagantly as though it could never be exhausted. At the mills on the line of railroad some very good-sized logs were noticed that had been flumed and floated from the higher elevations, and a fairly good quality of lumber was being made.

At two points in the Sage Desert, where not a spear of green was seen under natural surroundings, the possibilities of tree-growing and agricultural pursuits were observed, showing grand success. Where the land had been put under irrigation, forest and fruit trees, grasses, grains, and vegetables of the first order were growing most luxuriantly, making literally and truly "green spots in the desert." While we are not to expect much from this region in the matter of forestry, it is claimed the possibilities exist, and it is well to note them.

Lumber production in Nevada.

BOARDS AND OTHER SAWED LUMBER.

County.	1882.	1883.	Increase.	Decrease.
Lincoln	262,000	.....	.....	262,000
White Pine	350,000	200,000	.....	150,000
	612,000	200,000	.....	412,000

UTAH.

Last spring I visited a portion of Utah in person, and secured the promise of a full report from there. Thus far I have received nothing save lumber statistics, from six counties. I found some good timber of natural growth in the cañons east of Salt Lake and along the line of the Union Pacific Railroad. From Ogden down the valley to Salt Lake City, and south, there was considerable tree-planting, principally, however, of the soft woods. They were doing better with slight irrigation, but were thrifty without. Along Echo and Webber Cañons there was quite a show of young timber planted. The people everywhere in Utah were feeling the need of timber-growing, and those who had experimented were well satisfied with results. An abundance of timber will undoubtedly be grown in Utah.

Lumber production in Utah.

BOARDS AND OTHER SAWED LUMBER.

County.	1882.	1883.	Increase.	Decrease.
Cache.....feet..	800,000	450,000	.....	350,000
Davis.....do...	110,000	210,000	100,000	.....
Iron.....do...	360,000	303,000	.....	57,000
Morgan.....do...	500,000	500,000	.....	.....
Summit.....do...	50,000	125,000	75,000	.....
Washington.....do...	80,000	90,000	10,000	.....
	1,900,000	1,678,000	185,000	407,000

LATHS.

Cache.....number..	.....	100,000	100,000	.....
Iron.....do....	85,000	60,000	.....	25,000
Morgan.....do....	100,000	.....	.....	100,000
Washington.....do....	20,000	20,000	.....	.....
	205,000	180,000	100,000	125,000

SHINGLES.

Cache.....number..	800,000	800,000	.....	.....
Washington.....do....	100,000	100,000	.....	.....
	900,000	900,000	.....	.....

WISCONSIN.

Report by R. W. Furnas.

Where not otherwise indicated, prefatory remarks, as presented with report for Iowa, are applicable to Wisconsin. The same obstacles were encountered in efforts to obtain full replies to circulars sent.

Of Form A 46 circulars were sent to Department correspondents, and 38 replies received; of Form B 449 were sent to mill-owners and lumber dealers, and 187 replies received. To individuals of personal acquaintance 38 circulars of both forms were transmitted, and 25 replies received; and the individual correspondence was much more satisfactory

than either of the others. Of the 63 counties in the State reports are presented for 41.

Few of the questions in Form B were answered except those referring to lumber statistics, which have been tabulated like those for Iowa.

For limit in dimensions of timber for mill purposes, 7½ inches, is the lowest record presented. The average will be perhaps 10 to 12 inches, and the number of average logs for 1,000 feet of boards may be estimated at 7½.

The aggregate for boards and other sawed lumber, as reported, shows for the year 1882, 1,104,917,669 feet; for 1883, 1,241,069,511, being an increase of 136,151,842. Laths for 1882, 218,295,150; for 1883, 269,134,603, being a gain of 50,839,453. Shingles for 1882, 512,246,250; for 1883, 658,692,700, a gain of 86,446,450.

ADAMS COUNTY.

This county was originally timber-clad. About one-eighth has been cleared off, the varieties being oaks, pines, basswood, elms, soft maple, white walnut, and black cherry. While a large proportion was cut for lumber, a majority of land cleared was used for agricultural purposes. New timber is growing as fast as the old is being consumed. With care there will be no timber famine in Adams County. The possibilities for successful timber-planting are good, but none is being done. The county has suffered from forest fires in an early day, but not any of late years.

BARRON COUNTY.

Nine-tenths of this county was originally in pine, with some hard wood. Lumbermen have about cleaned it all out, some little hard wood and culled pine lands remaining. The hard woods are inferior, as compared with those of other States. Fires have destroyed fifty per cent. of the original growth, and contiue to remove all hopes for the young timber that would come on and take the place of the old, if at all guarded. There seems to be no effort to protect it, and a few years will destroy all timber prospects. Fires catch each dry season in the *débris* left by lumbermen, and "run wild."

BROWN COUNTY.

Eastern Wisconsin, north of Milwaukee and south of Oconto, was originally covered with a heavy growth of pine and oak, more pine than oak, especially the north half of the area indicated. The pine is nearly all gone, and perhaps three-fourths of the oak. These forests were cleared principally for lumber and fuel. A small portion was originally cleared for agricultural use, but largely for the same purposes within a few years past. Where new timber appears of spontaneous growth, it is principally quaking aspen, of little value for any use. A small proportion of the new growth is pine and oak. In some portions the land has been burned over so often it has become almost destitute of any kind of vegetation, and is desert-like in all its characteristics. The possibilities of forest-tree planting are good, but of course nothing is being done. Pine forests have suffered greatly from fires, and there is no controlling them when under way. The same old story is told regarding the origin of fires catching in *debris* left by lumbermen. The intelligent correspondent, in referring to the duty of the General Government as to preservation and increase of forests on public domain, says: "I

know of nothing better than to pursue a course somewhat similar to that of the German Government." There is no fixed rule as to deterioration of trees. Some varieties decay sooner than others; all depends on conditional surroundings. Timber for general purposes is best cut before the tree reaches its maximum.

CALUMET COUNTY.

"The whole of the counties of Calumet, Manitowoc, and Sheboygan were originally timbered," says the correspondent, the varieties being tamarack, cedar, basswood, ash, elm, and maple. About four-fifths has been cut, and the land used in the main for agriculture. No tree-planting is being done, and but little care is taken of the natural growth.

CHIPPEWA COUNTY.

The northern portion of the county is the "great pinery," and is fast disappearing, all having been taken for lumber, except in the vicinity of the large settlements, where considerable is used for fuel. Very little land is cleared for agricultural uses. Young timber does not seem to take the place of the old to any extent. Ground generally takes to wild blackberries and raspberries. In a few instances young timber comes in quickly, and grows rapidly. Forest fires have been destructive. Pines grow to a great age without showing evidence of decay. The correspondent, who seems to understand what he is writing about, thinks, for general purposes, timber should be mature before being cut.

DANE COUNTY.

Three-fifths or more of the area of this county was originally well clad with hard woods, largely in oaks, which is the case with adjoining counties. It has been mostly cleared for agriculture. The timber has been used for fencing, firewood, and other domestic purposes. Still there are 95,000 acres in young growing timber. Coal is now largely used for fuel, and therefore the coming supply will more than keep pace with the demand. In prairie districts some forest-tree planting is being done with success. No injury has occurred from forest fires.

DODGE COUNTY.

Fifty years ago, when the first settlements were made, fully 80 per cent. of the county was in valuable timber. Originally, cutting was done to obtain the use of land for farming purposes, and therefore the object was to get rid of the timber in the most expeditious way, most of it being burned on the ground. For the past fifteen years all timber cut has been economized. The remaining supply consists of oak, hard maple, poplar, elm, basswood, &c. In 1882 there were 42,354 acres of timber land; of this, perhaps one-third is young timber, thrifty and growing rapidly. No attention is given to tree-planting. In 1883, 820 acres of wooded land was cut off. It is estimated that oaks will reach their prime in 100 years; poplar and maple at from 60 to 75.

DOOR COUNTY.

This county was originally all in timber, the varieties being oak, hickory, poplar, pine, spruce, beech, tamarack, elm, maple, basswood, birch, cedar, and hemlock. Three-fourths at least has been cut, and that

remaining is inferior in both variety and quality. The principal uses of timber were for lumber, posts, railroad ties, telegraph poles, and square timber. Much was cleared for agriculture. There is new growing timber on nearly all the land cut off not in agricultural use. As to tree-planting, nearly all the varieties known in the Northwest do well. Thinning out the new growth, as a rule, would answer present purposes. The great fire of 1871 destroyed outright a vast amount of valuable timber, and that left standing is more or less injured. "The General Government should district all the public domain, and appoint an agent for each district to guard the timber and prosecute timber depredators," says a correspondent. He further says, and very much to the point:

The deterioration of trees of all kinds depends entirely on surrounding conditions, particularly the soil. A cedar, for instance, will grow tall, large, old, and sound in wet soil. On dry land it will be scrubby, short-lived, and decay, comparatively speaking, in a short time. So with all other varieties.

DOUGLAS COUNTY.

The whole county was originally covered with timber of small growth, except pine and cedar, the varieties being pine, tamarack, spruce, balsam, birch, poplar, white and red cedar. Seventy per cent. has been cut for saw logs, telegraph poles, and destroyed by fire. The growing young timber amounts to nothing, and wasteful cutting and slashing is the rule. Where fires are kept out, or do not reach, young timber grows rapidly, covering the ground more densely than the original growth. While lumbermen cut timber and leave the *débris*, there can be no protection against forest fires. Where pines and other varieties incident to this county are killed by fire, worms soon destroy them entirely. Fires running over the soil injure its productive properties. "If this destruction of both timber and soil is not stopped, this county will become a barren desert," says the correspondent. One-third of the denudation has been caused by forest fires. "If lumbermen were compelled to trim up trees felled, and burn the brush at once, 90 per cent. of fires would be prevented, and when they did occur could be controlled and subdued," writes an intelligent gentleman. Almost any variety of timber can, with care and attention, be grown in this county.

EAU CLAIRE COUNTY.

The correspondent is exceedingly brief. The following is his report in full:

Timber lands have been cleared principally for cultivation and firewood. There is no necessity for planting forests, as this region is well supplied, principally with oak. Perhaps 90 per cent. damage has been caused by forest fires, chiefly through carelessness.

FOND DU LAC COUNTY.

This county originally was about all covered with timber, the central and southern portion being of heavy growth, and balance in "openings," as they are called, except small areas of marsh prairie. Timber has been largely cut, both for fuel and hard-wood lumber. In the heavily timbered districts, where cut off, the new growth will not amount to much. The "opening" districts show more and better timber than the original. On these "openings," thirty years ago, the wood growth was mere brush; it is now producing twenty to thirty cords of wood per acre. The possi-

bilities for timber-culture are good, but not much is being done. Some valuable varieties of hard woods have been planted and are thriving. "For durability, cut timber in June. We have poplar and basswood rails cut in June, thirty-five years ago, good and sound yet," says the correspondent.

GREENE COUNTY.

A goodly portion of this county was originally in timber, the varieties being oaks, black and white walnut, hard and soft maple, poplar, basswood, hickory, and elms. It was principally cleared off for farming purposes. The timber was not wasted, but all has been utilized. Logs suitable for saw timber were used for that purpose. There seems to be no fear of a lack of timber. While no attention is given to tree-planting at present, young timber of natural growth is developing rapidly, and supposed to equal the demand. Blight has affected oak trees to some extent.

GREEN LAKE COUNTY.

More than one-half of this county was originally timbered, principally with hard woods. Seven-eighths of the original has been cleared off and used for lumber, rails, and fuel. Where undisturbed, the young growth is coming forward rapidly, but not one-tenth of this is protected or permitted to grow. Timber could be planted advantageously, but nothing is being done in that direction.

JUNEAU COUNTY.

In 1851, when the first settlements were made, this county was nearly all covered with a small growth of oak and pine. There had evidently been a former forest, and this was a new growth. This new growth was nearly all cut to obtain land for agricultural purposes. There is more good timber now than in 1857, and the new growth is rapid. It is not necessary now to plant forests, or any trees, except for ornamental purposes. Forest fires have not occurred to an extent worthy of record. "Some varieties of timber deteriorate earlier than others. Jack oak and jack pine decay very soon, say at fifty years, while white oak and white pine will not show signs of decay under two hundred to three hundred years," says the intelligent correspondent.

KENOSHA COUNTY.

The correspondent furnishes but few data. The county is well timbered. The uses have been for fuel and fencing. About as much timber exists as twenty years ago. No tree-planting and no forest fires are reported.

KEWAUNEE COUNTY.

This county was formerly all in timber, the varieties being hemlock, cedar, basswood, and some pine. Seven-eighths has been cut off, one-half to obtain land for agricultural uses, and the balance for lumber, shingles, railroad ties, laths, fence posts, and fuel, largely exported to market. The new growth amounts comparatively to nothing in replacing the old supply. No forest trees are being planted. Forest fires have occurred to some extent in early days, but none of late.

LA FAYETTE COUNTY.

Thirty years ago 45 per cent. of the area of this county was well timbered. At least 15 per cent. has been cleaned off for farming uses. The varieties of timber are principally oak, black and white walnut, and poplar. The uses have been for lumber, building, and fencing. The new growth is equal to the demand, and wood and timber lands are cheaper than twenty years ago. Where land has been cleared and not tilled, or where old fields have been thrown out, they are quickly covered with a young growth. Timber is yet too plenty and cheap to warrant attention to forest-tree planting.

MARQUETTE COUNTY.

This county was originally all covered with valuable white, black, and burr oak timber. While largely cut to obtain use of the land, much of the timber was used for lumber, fencing, and fuel. There is yet plenty of timber, and the new growth, besides, is about equal to the demand. About 30 per cent. is now in growing timber.

MILWAUKEE COUNTY.

This county, originally, was very heavily timbered with oaks, elm, maple, beech, black and white walnut, basswood, black and white ash, of which 90 per cent. has been cut off. In early days timber was cut to get rid of it, and to clear the land for agricultural purposes. Later it was cut for lumber, piling, staves, bolts, and cordwood. Not over 1 per cent. is now in young wood, growing naturally. "Farmers are too busy digging for the dollars to think of planting trees other than for ornamental uses. I have resided in the county for 47 years, and have never seen a forest fire," writes one correspondent. Another correspondent, referring to the increase and preservation of forests on the public domain, says:

Repeal all pre-emption, timber-culture, and homestead laws; sell land only to actual settlers, and at $1 per acre; repeal all land grants to railroads; give a good bounty for every five acres of timber successfully planted, State legistures exempting the same from taxation for, say, twenty years.

MONROE COUNTY.

Two-thirds of this county was originally in timber, principally pine. One-half has been cut, but that remaining is of little value, comparatively. The clearing has been done for both lumber and agriculture. Where hard woods come in spontaneously, in place of that cut, the character is promising, and if protected will be of great value. There are about 576,000 acres of land in the county. Fires run through the timber annually, destroying a large portion of the young growth. Five per cent. of the best pine trees have been destroyed by forest fires.

OCONTO COUNTY.

This county was thickly timbered originally, but is now cleared off to a large extent. The varieties were largely pine, with some hard woods. Nearly all has been used for lumber. Fires have been fearful, destroying fully one-half of the original growth.

OUTAGAMIE COUNTY.

This county is a hard-wood belt between the prairies of the south and evergreens of the north. The whole county originally abounded in timber, but only about three-fourths is left standing. Most of the one-fourth cut was for agricultural purposes. Of late years timber has been taken for hard-wood lumber. There are no new growing forests. Wood is becoming scarce and high—$4 to $5 per cord. The varieties of timber are not reported.

PIERCE COUNTY.

Pierce and Saint Croix Counties embrace about 700,000 acres of land. Originally, at least two-thirds of the area was heavily timbered with hard woods. About 130,000 acres have been cleared. Some pine timber was, and is still growing. The clearing was mostly done for agricultural uses, and all valuable timber worked into lumber. No attempt has been made to grow forest trees by planting, except for ornamental purposes. Portions of the timber districts cut off are at present owned by prairie farmers. There is a young spontaneous growth of value now, which will become greater in the future. Forest trees can be grown with success, but planting is not thought to be now needed. Fires have not occurred to any extent. The correspondent is of opinion, if the timber-culture act were strictly observed, "it would be worth millions to the county."

POLK COUNTY.

One half the original supply of timber in this county has been cut; there is some pine remaining, but the supply was principally of hard woods, all of rather poor quality. Most of the land has been cleared for lumber and fuel; perhaps one-eighth of the land cleared has been used for agricultural purposes. It is estimated that 2½ per cent. in acres is at present in young wood growing naturally. There is no need as yet for forest-tree planting. Five per cent. of the original timber has been destroyed by fire.

PORTAGE COUNTY.

Without stating the original timber area of this county, our correspondents simply narrate in general terms that about half has been cut for lumber, fencing, fuel, and to use land for farming. That remaining is scrub oaks, jack pines, and tamarack, which may be taken as types of the original growth. The new growing timber will not more than equal one-fifth of the old. About 10 per cent. of timber has been destroyed by fire.

RACINE COUNTY.

Three-fourths of this county was originally covered with white, burr, and red oak; hickory, elm, walnut, maple, and poplar. Nearly all has been cut over and the timber used for railroad ties, fencing, and fuel. Much of the land cleared has been taken for agricultural purposes. Returns show 14,712 acres of natural-growth young timber in existence. No tree-planting has been done, except for ornamental purposes, and no fires have occurred.

RICHLAND COUNTY.

Half the counties of Richland, Vernon, Sauk, and Crawford were originally covered with an inferior grade of pine timber. All of any

value has been cut, and the land used for agriculture. Of late years there is more of a disposition to husband the timber. Nothing has been done in the way of planting timber, and but little protection is given the young spontaneous growth. No fires have occurred for years past. "Timber should be cut," says our correspondent, "oaks and basswood, at from fifty to seventy-five years; maple at, say, forty."

ROCK COUNTY.

One correspondent covers, in his report, Racine, Kenosha, Walworth, Rock, Green, and Jefferson Counties. One-half the area of these counties was originally covered with hard woods, largely oaks, of which not over one-tenth now remains. It has been mainly used for lumber and fuel, and very little wasted. One-fifth of the first timber area is now covered with a promising second growth. As coal is employed so largely for fuel, the coming timber growth will more than supply the demand for domestic purposes. Evergreens are being planted largely for wind-breaks and stock protection, also spruce, Scotch pine, and arbor vitæ. Considerable planting also has been done of the hard-wood varieties of timber—oak, walnut, ash, and larch. No forest fires of note have occurred. Ash and larch grow well on both high and low lands, and are useful and valuable to cut at the age of ten years. Evergreens do not reach a period of usefulness and value for cutting short of twenty-five to thirty years. The walnuts require greater age for value, except for nuts.

Another correspondent reports Rock and Dane Counties as substantially alike in all respects. They were originally well wooded with valuable varieties of timber, such as poplar, oaks, and hickories, and these have been cleared off until, probably, not one-third the original supply remains. The great object in clearing has been to obtain land for agriculture. There are no growing forests except those that have escaped the ax. The possibilities for planting forests are all that could be desired, but none is being done.

SAUK COUNTY.

Originally 80 per cent. of the area of this county was in timber, principally oaks and hard maple. Fifty per cent. is yet timbered, but mostly of young growth, and on untillable lands. The cut was for lumber and fuel, and none has been wasted. The need of tree-planting is not yet apparent. "Trees one hundred and thirty years old seem to be as vigorous and thrifty as ever," says a correspondent.

SHEBOYGAN COUNTY.

This county in 1852, the date of first settlement, was a dense forest of hard maple, white and red oak, white and black ash, hickory, cherry, basswood, birch, and isolated groves of the finest white pine and cedar. About one-third is left, but the best has been culled and stripped. The timber cut was for lumber, ship-building, cooperage, shingles, &c., and the land cleared used largely for agricultural purposes. New growing timber does not give flattering encouragement that it will fill the place of the old. The small growth is kept cut close for hoop-poles. The possibilities of forest-tree growing are good, but nothing is done practically in that direction. No forest fires have occurred. The population is composed generally of careful, prudent Germans, who look

well to all protection. One correspondent is an intelligent Bavarian, who holds to the old German plan of encouraging and protecting forests. As a close observer, he puts ages of trees for different uses as follows: Oak, for hoop-poles, 5 to 8 years; 8 to 16, for wagon stuff; 35 to 50, for machinery; 50 to 75, for lumber and ship-timbers. Pines, greatest value, at 75 to 80. Beech, 60 to 100. Hemlock, 45 to 75.

TREMPEALEAU COUNTY.

The original growth of this county consisted of oaks, hickory, maple, elms, and other hard woods. Three per cent. has been cut, the land used for agricultural purposes, and wood burned in heaps on the ground. The growing forests will supply all that has been removed. There are about 3,000 acres of young timber growing. "For general purposes, timber should be cut at from 20 to 25 years old," says a correspondent.

VERNON COUNTY.

In this county, the correspondent says, timber has been unmercifully slaughtered, without any regard whatever for economy, and used for nearly all purposes, much having been burned to get rid of it. Young growing timber will not supply more than one-third of that cut away, and this, also, is being cleared for farming lands and fuel. Not much damage by fire has occurred of late. The correspondent is of opinion that "to offer bounties for timber-planting and exempt from taxation" would greatly encourage reproduction.

WASHINGTON COUNTY.

Originally this county was covered with timber, principally oaks, beech, and hard maple. Three-fourths has been cut, and until within a few years, burned to obtain land for manfacturing purposes. Nearly every section of land has yet some timber to spare; hence no attention is paid to planting. The possibilities, however, are good.

WAUPACA COUNTY.

This county originally was nearly all covered with oaks, maple, ash, elm, pines, tamarack, &c. Two-thirds or more has been cut, mainly for lumber, and afterwards cleaned up for farming uses. There is still a fair supply, but it is rapidly diminishing. The natural growth is doing but little toward replacing that cut. Much of the swampy and marsh land is yet covered with tamarack. The natural advantages for growing young timber are good, but under existing circumstances nothing need be looked for in that direction. "Grain and calves pay better than timber growing," says one correspondent. Thirty per cent. of the fires originate from "pine stackings" taking fire, and running over vast sections before it can be arrested. "Millions of thrifty trees are annually destroyed, and there is no preventive while lumbermen are permitted to make such indiscriminate slaughter," is the language of one who has given the subject much attention. To preserve and increase forests on the public domain, "there should be a clause in every patent compelling the patentee to keep a certain portion in timber, by replanting as often as removed," says the correspondent.

WAUSHARA COUNTY.

Fifty per cent. of the original timber area of this county has been cut, to use the land for agriculture. The timber cut and remaining is

principally of hard woods, such as oaks, ash, and hard maple. The growing forests will not supply over two-thirds of the demand. Pine forests here and near are all disappearing very fast. The timber now being cut is one-fourth lighter than that taken three and four years ago. No attention is given tree-planting, and no fires have occurred of late.

Lumber production in Wisconsin.

BOARDS AND OTHER SAWED LUMBER.

County.	1882.	1883.	Increase.	Decrease.
Ashland ..... feet..	89, 000, 000	143, 200, 000	54, 200, 000	.....
Buffalo ..... do...	800, 000	1, 100, 000	300, 000	.....
Brown ..... do...	21, 950, 000	22, 500, 000	550, 000	.....
Bayfield ..... do...	6, 500, 000	18, 000, 000	11, 500, 000	.....
Barron ..... do...	16, 800, 000	17, 750, 000	950, 000	.....
Calumet ..... do...	500, 000	2, 000, 000	1, 500, 000	.....
Chippewa ..... do...	3, 500, 000	6, 150, 000	2, 650, 000	.....
Crawford ..... do...	2, 650, 000	18, 000, 000	15, 350, 000	.....
Clark ..... do...	7, 100, 000	16, 600, 000	9, 500, 000	.....
Dodge ..... do ..	125, 000	135, 000	10, 000	.....
Dunn ..... do...	11, 230, 000	27, 400, 000	16, 170, 000	.....
Eau Claire ..... do...	352, 326, 000	332, 260, 000	.....	20, 066. 000
Fond du Lac ..... do...	12, 200, 000	15, 500, 000	3, 300, 000	.....
Grant ..... do...	6, 000, 000	4, 500, 000	.....	1, 500, 000
Green ..... do...	150. 000	200, 000	50. 000	.....
Jefferson ..... do...	.....	150, 000	150, 000	.....
Jackson ..... do...	20, 400. 000	20, 900, 000	500, 000	.....
Juneau ..... do...	38, 700, 000	44, 600, 000	5, 900, 000	.....
Kewaunee ..... do...	500, 000	1, 200, 000	700, 000	.....
Lincoln ..... do...	37, 500, 000	37, 000, 000	.....	500, 000
Langlade ..... do...	5, 000, 000	11, 000, 000	6, 000, 000	.....
La Crosse ..... do...	56, 030, 310	53, 365, 968	.....	2, 664, 342
Milwaukee ..... do ..	1, 550, 000	1, 570, 000	20, 000	.....
Marquette ..... do...	100, 000	80, 000	.....	20, 000
Manitowoc ..... do...	800, 000	900, 000	100, 000	.....
Marinette ..... do...	164, 625, 000	162, 500, 000	.....	2, 125, 000
Marathon ..... do...	65, 050, 000	67, 300, 000	2, 250, 000	.....
Monroe ..... do...	9, 550, 000	10, 750, 000	1, 200, 000	.....
Ozaukee ..... do...	175, 459	184, 241	8, 782	.....
Oconto ..... do ..	18, 476, 000	20, 285, 000	1, 809, 000	.....
Outagamie ..... do ..	50, 000	.....	.....	50, 000
Polk ..... do...	7, 000	8, 000	1, 000	.....
Pierce ..... do...	1, 060, 000	8, 013, 000	6, 953, 000	.....
Portage ..... do...	20, 477, 206	26, 769, 000	6, 291, 794	.....
Racine ..... do...	50, 000	50, 000	.....	.....
Richland ..... do...	4, 200, 000	6, 250, 000	2, 050, 000	.....
Sheboygan ..... do...	80, 000	225, 000	145, 000	.....
Saint Croix ..... do...	10 500, 000	13, 500, 000	3, 000, 000	.....
Shawano ..... do...	1, 600, 000	3, 850, 000	2, 250, 000	.....
Taylor ..... do...	6, 550, 000	8, 675, 000	2, 125, 000	.....
Vernon ..... do...	300, 000	350, 000	50, 000	.....
Winnebago ..... do...	54, 265, 094	63, 154, 302	8, 888, 208	.....
Waukesha ..... do...	40, 000	45, 000	5, 000	.....
Waushara ..... do...	1, 200, 000	1, 500, 000	300, 000	.....
Waupaca ..... do...	4, 000, 000	5, 500, 000	1, 500, 000	.....
Wood ..... do...	51, 250, 000	46, 100, 000	.....	5, 150, 000
	1, 104, 917, 669	1, 241, 009, 511	168, 227, 184	32, 075, 342

LATHS.

Ashland	300, 000	12, 200, 000	11, 900, 000	.....
Buffalo	163, 000	255, 000	92, 000	.....
Brown	2, 475, 000	3, 290, 000	815, 000	.....
Bayfield	.....	1, 400, 000	1, 400, 000	.....
Barron	3, 304. 800	3, 100, 000	.....	204, 800
Chippewa	500, 000	250, 000	.....	250, 000
Crawford	75, 000	100, 000	25, 000	.....
Clark	2, 431, 000	764, 000	.....	1, 667, 000
Dunn	3, 000, 000	9, 000, 000	6, 000, 000	.....
Eau Claire	100, 758, 000	103, 128, 000	2, 370. 000	.....
Fond du Lac	2, 000, 000	2, 400, 000	400, 000	.....
Grant	2, 300, 000	2, 500, 000	200, 000	.....
Jackson	400, 000	1, 600, 000	1, 200, 000	.....
Juneau	7, 144, 000	7, 558, 000	414, 000	.....
Langlade	1, 000, 000	2, 000, 000	1, 000, 000	.....

Lumber production in Wisconsin—Continued.

LATHS—Continued.

County.	1882.	1883.	Increase.	Decrease.
La Crosse	11,819,850	18,766,950	6,947,100	
Lincoln	5,850,000	7,950,000	2,100,000	
Manitowoc		80,000	80,000	
Marinette	34,180,500	36,937,000	2,756,500	
Marathon	5,052,000	7,563,000	2,511,000	
Monroe	1,750,000	1,950,000	200,000	
Oconto	2,873,000	12,017,000	9,144,000	50,000
Outagamie	50,000			
Polk	2,000	3,000	1,000	
Pierce		33,000	33,000	
Portage	2,500,000	4,400,000	1,900,000	
Racine	100,000	2,700,000	2,600,000	
Richland		100,000	100,000	
Sheboygan	700,000	800,000	100,000	2,902,347
Winnebago	16,842,000	13,939,653		
Waupaca	125,000	200,000	75,000	
Wood	600,000	2,150,000	1,550,000	
	218,295,150	269,134,603	55,913,600	5,074,147

SHINGLES.

Ashland	3,300,000	11,150,000	7,850,000	
Buffalo	817,000	1,342,000	525,000	
Brown	6,500,000	10,000,000	3,500,000	
Bayfield		2,000,000	2,000,000	
Barron	6,500,000	7,800,000	1,300,000	
Chippewa		650,000	650,000	
Clark	6,992,000	12,095,000	5,103,000	
Dunn	9,000,000	12,000,000	3,000,000	
Eau Claire	201,910,000	197,110,450		4,799,550
Fond du Lac	1,400,000	3,000,000	1,600,000	
Jackson	10,675,000	23,400,000	12,725,000	
Juneau	18,193,000	17,132,000		1,061,000
Langlade	9,000,000	20,000,000	11,000,000	
La Crosse	28,456,750	31,032,250	2,575,500	
Lincoln	25,510,000	34,500,000	8,990,000	
Manitowoc		970,000	970,000	
Marinette	29,905,000	27,191,000		2,714,000
Marathon	29,129,000	34,426,000	5,297,000	
Monroe	1,200,000	225,000		975,000
Oconto	13,000,000	21,954,000	8,954,000	
Outagamie	2,000,000	4,000,000	2,000,000	
Pierce		3,000,000	3,000,000	
Portage	15,237,000	20,647,000	5,410,000	
Saint Croix	9,900,000	10,600,000	700,000	
Shawano	150,000	900,000	750,000	
Taylor	12,229,000	14,500,000	2,271,000	
Winnebago	40,742,500	41,068,000	325,500	
Waupaca	4,000,000	5,000,000	1,000,000	
Wood	86,500,000	91,000,000	4,500,000	
	572,246,250	658,692,700	95,996,000	9,549,550

WYOMING.

Reports from Wyoming are exceedingly meager, and the sources of obtaining information equally so. From personal knowledge of many conditions in the Territory, it is conceived that the data herewith presented do not fairly indicate the facts. Of Form A reports have been received only for three counties. There are, however, only seven organized counties in Wyoming.

Fully one-half the area of Albany and Johnson Counties is now covered with a fair quality of timber. Along the streams cottonwood and box-elder, and on the mountains fair pine, spruce, and cedar. Much better pine is found on the higher ranges, but it is inaccessible. All the

cut has been for lumber and railroad ties, the latter in great quantities. Different from most other sections, the pines of this region reproduce themselves, the new growth seeming more vigorous and promising than the old. This doubtless is attributable to the fact that fires are less frequent than before white settlers had charge of the country. A few efforts are being made to plant timber. It is thought that climatic changes incident to such regions are gradually bringing about more favorable conditions, and that tree-culture will, in course of time and not in the far future, be found practical and successful. Forest fires have been very destructive, originating from carelessness or what is worse.

About the same condition of affairs is found in Uintah County, as shown by reports received. There is probably a greater area and better timber found here than in the other two counties named. A correspondent is of opinion there is an increase of timber area, counting the young growth coming on since white settlers came in, and more care is being exercised in relation to forest fires. As to tree-planting, he says: "No planting is done except for shade and ornamental purposes, and that not at all satisfactory. I think high altitude, exposure to storms, cold, long summer droughts, preclude the probability of much successful tree-planting. It may be that time will bring about more favorable climatic conditions; such would only be "history repeating itself."

But one report has been received as to saw-mills—that at Rawhide. About 100,000 feet of lumber have been sawed in each year, 1882 and 1883, and 75,000 shingles for the same periods.

I have personal knowledge that 350,000 young forest-tree seedlings were sent into Wyoming during the spring of 1884 to be planted, principally of soft woods, such as cottonwoods and box-elder. This was mostly in Laramie County, in the region of Cheyenne, and the town of Laramie, in Albany County. The valleys will, in due time, undoubtedly grow timber successfully.

REPORT ON TREE GROWTH—MAXIMUM SIZE AND AGE—PERIOD OF DECLINE—COMPLETION OF CYCLE, ETC.

By R. W. FURNAS, *Agent of the Department.*

In presenting this paper, I desire it to be distinctly understood that I disclaim any attempt whatever to offer a scientific dissertation on this feature of forestry. The subject-matter is treated in a brief, plain, and practical manner, being simply a presentation of facts, the results of twenty-nine years' experience and close observation of a region naturally timberless, where successful efforts have been made to grow trees.

As is well known, the great objection to a prairie country is its want of timber, more especially for fuel and fencing purposes. Those of us who crossed the Missouri River into what for all time before had been known only as the "Great American Desert," immediately following the extinguishment of the Indian title of lands in 1854, by the passage of the "Kansas-Nebraska act," prompted by the adage, "Necessity is the mother of invention," soon demonstrated that we could raise our own timber, have it where we desired, and, in fact, for the purposes indicated, grow it sooner than the old heavily timbered regions could be cleared and the lands subjugated for agricultural uses. Thus we became experimenters and observers. A quarter of a century's training in that direction, with extracts from the records of earlier and more extended knowledge, is embodied and epitomized in this paper.

When one launches out into the broad and really boundless field of study and observation, to learn of the growth, maximum size, age, period of decline, and final completion of tree cycle, he is forced to about the same conclusion that Pliny reached long ago, when he summed up his investigations by saying, "The life of some trees may be believed to be *prodigious*." This is not comforting, but contains much of truth. I am strongly inclined to the opinion that there are no more unerring indications as to ages of trees than of men and animals. Some men become gray, wrinkled, and tottering almost in their teens. Among those of the same family, and seemingly raised under the same conditions, one may be small in stature and another large. Others reach their threescore and ten fresh and vigorous almost as boys. It is the same with the lower animal creation; all depends on constitution, conditions, and surroundings, as I shall be able, I trust, to satisfactorily show.

Concentric or annual rings were once considered and accepted in the nature of legal evidence. The measurements were nearly the same; and yet we find they both fail, except where climate, soil, temperature, humidity, and all other surroundings are regular and well balanced. Otherwise, either rings or measurements are little more than guesswork. The only regions, within the range of my investigations, where either rings or measurements were reliable indications, are in the secluded, even, and regularly tempered valleys and cañons of the Southern Pacific coast.

I present herewith a table of yearly measurements of twenty different varieties of young timber of my own and known planting in Southeastern Nebraska, made in person during a period of 25 years, showing the growth from year to year during the time of investigation and experiments:

Kind of tree.	1 year old.	2 years old.	3 years old.	4 years old.	5 years old.	6 years old.	7 years old.	8 years old.	9 years old.	10 years old.	11 years old.	12 years old.
White elm	1	2	2	3	4	5	6	7	8	9	10	11
Catalpa	1	2	3	4	5	7	9	12	15	19	22	24
Soft maple	1	2	3	4	6	7	9	11	13	17	19	
Sycamore	1	2	2	2	3	5	7	9	11	13	16	
Pig hickory	1	2	1	2	3	5	7	8	9	11		
Cottonwood	1	3	4	7	9	12	16	19	27	32	37	
Chestnut	1	2	4	5	6	7	9	11	14	16		
Box-elder	1	2	3	5	6	7	9	11	13	15	17	
Honey locust	1	2	3	5	6	8	9	11	12	14		
Black locust	1	2	3	5	8	9	11	13	15	16		
Coffee tree	1	2	4	6	8	10	12	14	16	18	19	
Burr oak	1	2	1	2	4	6	9	11	13	16		
White oak	1	2	1	2	4	6	9	11	13	19		
Black walnut	1	2	4	6	9	11	13	15	17	19		
Osage orange	1	1	2	4	6	7	8	10	11	12		
White pine	1	2	3	6	9	12	14	17	19	22	24	
Red cedar	1	2	4	5	7	9	11	13	16	19		
Mulberry	1	2	3	5	9	12	15	18	21			
Yellow willow	1	2	4	6	9	12	16	26	36	42	50	

Kind of tree.	13 years old.	14 years old.	15 years old.	16 years old.	17 years old.	18 years old.	19 years old.	20 years old.	21 years old.	22 years old.	23 years old.	24 years old.	25 years old.
White elm	13	15	16	19	22	25	28	31	34	37	41	43	46
Catalpa	25	27	30	34	39	43	48	52	54	61	66	71	75
Soft maple	21	22	25	27	32	35	38	46	52	58	60	68	72
Sycamore	19	23	24	26	28	29	30	32	35	38	40	44	47
Pig hickory	13	15	17	18	21	23	26	28	30	32	34	36	39
Cottonwood	43	45	49	56	64	72	81	92	100	111	120	126	134
Chestnut	19	24	25	26	28	29	31	33	36	44	48	52	56
Box-elder	19	23	25	26	27	32	34	36	39	41	46	47	49
Honey-locust	15	16	19	21	23	26	29	34	38	43	46	48	53
Black locust	16	18	19	24	25	27	29	31	33	35	37	41	44
Coffee tree	21	21	22	23	24	26	28	30	32	33	34	36	38
Burr oak	19	21	23	24	26	28	30	33	36	39	41	42	44
White oak	20	22	24	26	28	30	32	34	36	38	39	42	44
Black walnut	22	24	27	30	33	36	40	44	46	48	51	54	56
Osage orange	14	16	16	17	18	20	22	23	26	29	31	33	34
White pine	26	28	31	33	35	37	39	40	42	44	45	47	49
Red cedar	22	24	27	28	30	32	34	38	41	43	45	48	51
Mulberry	24	26	29	30	31	33	35	38	42	44	47	50	52
Yellow willow	56	64	72	80	89	93	98	100	110	119	125	130	136

It will be seen that the annual growth is very irregular; sometimes small, at others scarcely perceptible, and again quite large. This I attribute to irregular conditions. Some seasons are propitious and others the contrary. By reference to concentric rings, especially in young trees, the propitious and adverse seasons are readily distinguished by their size. As trees increase in age inner rings decrease in size to almost entire disappearance or obliteration, at least to the naked eye. Diminished rate of growth after a certain age is found to be the rule.

Four beeches mentioned by Loudon show greater variability. The ages and circumferences are given:

Locality.	Age.	Circumference.
	Years.	*Feet.*
One in King's County, Ireland	60	17
One at Foster Hall	100	12
One at Contachy Castle	102	18
One at Callander Park	200	17

So that of three beeches, nearly the same in size, one was only 60, another 102, and another as much as 200 years old. And this variability of rate is still more conspicuous in the oak. De Candolle, the Swiss botanist, who counted the rings of several oaks that had been felled, found one which at 200 years old had only the same circumference as another had attained at 50. Some had grown slowly at first and then rapidly; others, like bad racers, had begun fast and ended slowly. And even the diminished rate of growth would not seem to be an invariable rule, for one oak 333 years old was shown to have increased as much between 320 and 330 as it had between 90 and 100.

This reduces the computation of the age of an oak to but little more than guesswork. The Cowthorpe oak, the largest existing in England, reached at one time 78 feet in circumference. Damory's oak, in Dorsetshire, was only 10 feet less when so decayed that it was cut up and sold for fire-wood in 1755; and the Donnington oak, in the vale of Gloucester, was 54 feet at the base when it was burned down in 1790. It is needless to mention other English oaks which are also claimants to a remote antiquity, but it is obvious from the very variable rate of the growth of oaks that size establishes no indisputable title, and that the Cowthorpe oak need not be the oldest English oak because it is the largest recorded.

From Loudon's statistics of oaks are extracted the following notices of trees, according to their age and girth:

Years.	Circumference.	Years.	Circumference.
	Feet.		*Feet.*
40	8	200	7½
83	12	200	25
100	12	201	21
100	18	220	20
100	21	250	19½
120	14	300	33
180	15	330	27

This table not only shows the great variability of growth, but, if we take the three specimens of 100 years old, gives us the high average of 17 feet as that of only the first century. Taking, then, as usual, the third as the average growth, we should require rather more than eight centuries for an oak of 50 feet, which reduces to a very small number the oaks in England that can claim a thousand years.

When, therefore, Gilpin, in his Forestry Scenery, speaks of 900 years as no great age for an oak, it must be said that very few oaks can be named which, by measurement, would sustain their title to that age. Tradition, which is always sentimental, leans naturally to the side of exaggerated longevity. William of Wainfleet gave directions for Magdalen College, Oxford, to be built near the great oak which fell suddenly in the year 1788, and out of which the president's chair was made, in memory of the tree. Gilpin assumes that for the tree to have been called great, it must have been 500 years old, and therefore, perhaps, standing in the time of King Alfred. But it is clear that it need not have been a century old to have fairly earned the title of great, and that, therefore, a period of six centuries may have covered its whole term of existence.

In the matter of concentric rings, I have in my possession a few specimens of trees planted in person, and of known age, showing: Black

locust, 6 years, 12 rings, averaging just 2 in each year; shell-bark hickory, 12 years, 21 rings; pig hickory, 6 years, 10 rings; wild crab-apple, 5 years, 11 rings, and chestnut oak, 24 years, 20 rings. This, it will be seen, does not average one ring each year. The rings are exceedingly distinct and plain. An American chestnut, 4 years old, had 9 rings, which was over 2 rings each year, while a peach of 8 years had 5 rings only.

Dr. A. L. Childs, a gentleman of practical science and close observation, who, while a resident of Nebraska, from 1854 to 1882, was noted for his complete and accurate record of seasons, climate, &c., contributes an article on the subject of concentric rings to the Popular Science Monthly, of December, 1883, from which the following is quoted:

In June of 1871 I planted a quantity of seed as it fell from some red-maple trees. In 1873 I transplanted some of the trees from these seeds, placing them on my city lots in Plattsmouth, Nebr. In August, 1882, finding them too much crowded, I cut some out, and the concentric rings being very plain and distinct I counted them. From the day of planting the seed to the day of cutting the trees was two months over eleven years.

On one more distinctly marked (although there was but little difference between them) I counted, on one side of the heart, 40 rings. Other sides were not so distinct; but in no part were there fewer than 35. There was no guess-work about the age of this tree. A daily record of meteorological events for the Smithsonian Institution, and Signal Office for over twenty years, and a life-long habit of daily record of all important events, had led to much care and caution in such matters. Hence, from my own record, I knew the tree had but 12 years of growth; and yet, as counted by myself and many others, it had 40 clear concentric rings.

I could select 12 more distinct ones (rings), between which fainter and narrower or sub rings appeared. Nine of these apparently annual rings on one section were peculiarly distinct; much more than the sub-rings. But of the remaining it was difficult to decide which were annual and which were not. When first cut, and while the wood was green and the cells filled with sap, these rings were very clear and plain, but as the water evaporated and the wood contracted they showed less plainly. I have a section of it now before me, and I cannot make out clearly over 24, where, when green, 40 were clearly visible. This section was not at first so distinctly marked as a section forwarded to Prof. Cleveland Abbe, of the Signal Office, at his request, although that, when forwarded, showed the rings much less conspicuously than when fresh and green.

The Hon. James J. Wilson, of Bethel, Vt., an old lawyer, and late senator in the State legislature, writes me, under date of August 15, that "at a trial in the district court at Woodstock, Vt., on a disputed line based upon a cut on a hemlock tree, a section of the tree embracing the cut was produced in court, and the rings outside the cut counted up from 40 to 50, while those on the opposite side were only 9 or 10." The verdict of the court was that "the rings were not a sure indication of the age of the tree."

That the more distinct concentric rings of a tree approximate, or in some cases exactly agree, in number with the years of the tree, no one, I presume, will deny; but that in most and probably nearly all trees, intermediate rings, or sub-rings, generally less conspicuous, yet often more distinct than the annual rings, exist, is equally certain.

These sub or additional rings are easily accounted for by sudden and more or less frequent changes of weather, and requisite conditions of growth—each check tending to solidify the newly-deposited cambium, or forming layer; and as long intervals occur of extreme drought or cold, or other unfavorable cause, the condensation produces a more pronounced and distinct ring than the annual one. Query: Has a tree grown in a conservatory, or place of unchanged conditions of heat and moisture, any concentric rings?

Thomas Meehan, editor of the Gardener's Monthly, and who has given attention scientifically to tree-growth, in reply to questions propounded by myself, relating to annual rings, says:

Our northern trees—all hard-wood trees—make many rings a year, sometimes as many as a dozen. But the last set of cells in the annual growth is very small, and the first very large; and as a consequence the annual growth can always be determined. There are times when, from local causes, there is no cell-growth in particular

places, or none of any consequence; and thus we may now and then find a slightly greater number of rings on one side of the tree, at the part cut across; but this only shows that the age of a tree may possibly be underestimated by the circle calculations.

J. A. Farrar, in Longman's Magazine, presents an elaborate paper on the "Age of Trees," from which the following is quoted:

The cypress affords an instance where the approximate certainty of its introduction into England enables us to form some conclusions with regard to its attainable age. The fact of its being first mentioned in Turner's Names of Herbs, published in 1548, makes it probable that it was not introduced into England before the beginning of that century. But, at all events, the cypress at Fulham, which in 1793 was 2 feet 5 inches at 3 feet from the ground, cannot have been planted there before 1674, the year that Compton, the great introducer of foreign trees into England, in the seventeenth century, became bishop of London. That gives a growth of about 2 feet in the first century; but sometimes it attains a higher rate, as in the case of the cypress planted by Michael Angelo at Chartreuse, which was 13 feet round in 1817, giving the average rate of over 4 feet in the first three centuries. Now, the cypress at Somma, between Lake Maggiore and Milan, for whose sake Napoleon bent the road out of the straight line, is not more than 23 feet in girth, so that the tradition which makes its planting coeval with Christianity would seem doubtful; though, if we take 3 feet as the first century's growth, and take the third as the average, it may evidently have been standing in the time of Cæsar, as the old chronicle of Milan is averred to attest.

The Lebanon cedar first planted at Lambeth in 1683 was only 7 feet 9 inches (girth measurements alone need be given) one hundred and ten years later. Dr. Uvedale's cedar, planted at Enfield not earlier than 1670, was 15 feet 8 inches when measured in 1835, *i. e.*, 165 years afterwards; and the large cedar of Uxbridge, which was blown down in 1790, was 118 years old when Gilpin measured it in 1776, and found it to be 15½ feet. We should, therefore, be justified in assuming 12 feet as the possible first century's growth of a cedar even in England; whence we may test the probability of the oldest cedars now on Mount Lebanon having been growing there in the days of King Solomon. In the year 1696 the traveler Maundrell measured one of the largest of them and found it to be 12 yards 6 inches. Four feet a century being the average rate, the cedar measured by Maundrell would have required only nine centuries to have attained its dimensions of 36 feet; so that it need have been no older than the time of Charlemagne, and, allowing for a more rapid growth on a site where it is indigenous, may probably have been considerably younger.

From the claims to antiquity of the cedars of Lebanon let us pass to those of the Tortworth Spanish chestnut, in Gloucestershire, which sometimes boasts to be the oldest tree in England, and bears an inscription to the effect that King John held a parliament beneath it. Sir Robert Atkyns, whose history of that country was published in 1712, usually bears the responsibility of connecting the tree with King John; but he only speaks of it as said by tradition to have been growing there in the reign of King John. It is 19 yards in compass, and seems to be several trees incorporated together, and young ones are still growing up, which may in time be joined to the old body. It was also probably on hearsay evidence that Evelyn spoke of it as standing on record that a chestnut (at Tamworth) formed a boundary-tree in the reign of Stephen. He may have assumed Evelyn to have meant the tree in question; we may pass the hesitation of tradition between two kings not remote from one another in time; and we may accept 57 feet as the maximum measurement, though no subsequent measurement gives so high dimensions. Now, that a chestnut may attain 17 feet in its first century is proved by the fact that a chestnut at Nettlecombe, planted within the recollection, and therefore within the life, of Sir John Trevelyan, who died in 1828, was over 17 feet. But we may be content with 15 feet for the first century. Then, on the principle of the third as the average, we should require a period of eleven centuries for 57 feet; but that this average would be too low is evident from the fact that in 71 years, *i. e.*, between 1766 and 1837, it was proved to have increased 2 feet in girth; therefore, we should have a diminished series between, say, 15 feet a century at one end and a little over 2 feet a century at the other. This might be at the following rate, taking each figure for the growth of a century: 15+13+10+8+6+3+2=57. By which calculation seven centuries would have been the tree's age when Sir Robert Atkyns declared it to be 57 feet in 1712, an antiquity that would amply satisfy tradition, but could not remove the probability that the tree is not a single trunk, but really a number of different trees that have become incorporated together.

A somewhat similar theory may be applied to the famous Castanea di Cento Cavalli, on Mount Ætna, so called because a Queen of Aragon and 100 followers on horseback are said to have taken shelter beneath it from a shower of rain. Brydone in 1790 measured the circumference to be 204 feet, but it seemed to him that the tree in question, of which only separate trunks remain, was really five separate trees, and though he professed to have found no bark on the insides of the stumps,

nor on the sides opposite to one another, yet a more recent traveler states, in Murray's guide-book, that this is only true of the southernmost stem, and that one of the masses still standing does show bark all around it, which would of course prove it to be a separate tree. Of the other large chestnuts on Ætna, the Castanea del Nave is rather larger than the Tortworth specimen, while the Castanea della Gullea is 76 feet at 2 feet from the ground. The rich soil of pulverized volcanic ashes combined with decomposed vegetable matter probably enabled them to attain their present size within a shorter period than would be implied by such dimensions elsewhere; but whether they are five centuries or ten it is absolutely impossible to conjecture.

We are certainly apt to underrate the possible rate of growth where a tree meets with altogether favorable conditions. The silver fir was only introduced into England in the seventeenth century by Sergeant Newdigate, and one tree of his planting was 13 feet round when Evelyn measured it eighty-one years afterwards. A comparison of the statistics of growths as above collected with reference to the oak indicates with respect to most trees a more rapid rate than is commonly supposed. Let us test the claims of some of the oldest limes. The Swiss used often to commemorate a victory by planting a lime tree, so that it may be true that the lime still in the square of Friburg was planted on the day of their victory over Charles the Bold, at Morat, in 1476. A youth, they say, bore it as a twig into the town, and, arriving breathless and exhausted from the battle, had only strength to utter the word victory before he fell down dead. But this tree was only 13 feet 9 inches in 1831, *i. e.*, 355 years afterwards, and it would be extraordinary if a lime had not attained in that period greater bulk than even an oak might have reached in a century. The large lime at Neustadt, in Wurtemberg, mentioned by Evelyn as having its boughs supported by columns of stone, was 27 feet when he wrote (1664), and in 1837 it was 54, so that within a period of 173 years it had gained as much as 27 feet. Consequently, making allowance for diminished growth, we may fairly assume that 200 years would have been more than enough for the attainment of the circumference of the first 27 feet, which it had reached in the time of Evelyn. No English lime appears to have reached such dimensions as would imply a growth of more than three centuries, though the lime at Depeham, near Norwich, which was 46 feet when Sir Thomas Browne sent his account of it to Evelyn, sufficiently dispels the legend that all limes in this country have come from two plants brought over by Sir John Spelman, who introduced the manufacture of paper into England from Germany, and to whom Queen Elizabeth granted the manor of Portbridge.

It would be natural to expect the greatest longevity in indigenous trees, and, though it has been much disputed what kinds are native to the English soil, etymology alone would indicate that the following trees were of Roman importation: The elm (*ulmus*), the plane (*platanus*), the poplar (*populus*), the box (*buxus*), the chestnut (*castanea*). The yew, on the contrary, is probably indigenous, though its opponents find some reason for their skepticism in the fact that its larger specimens are chiefly found in church-yards and artificial plantations. In favor of its claim is the fact that its pretensions to longevity seem to be better founded than those of any other English tree, not even excluding the oak. A yew that was dug up from a bog in Queens County was proved by its rings to have been 545 years of age; yet, for the last 300 years of its life, it had grown so slowly that near the circumference 100 rings were traceable within an inch. Some great and sudden change for the worse in the external conditions may have accounted for so slow a rate, but, even if we take so much as one foot a century as the normal growth of a yew, we should have to allow 56 centuries for the Fortingal yew in Scotland, which, in 1769, measured as many feet; and a longevity in proportion must be accorded to the yews of Fountain Abbey, or the Tisbury yew in Dorsetshire, which boasts of 37 feet in circumference. Hence tradition in this case would seem to contain nothing incredible when it asserts that the yews on Kingly Bottom, near Chichester, were on their present site when the sea kings from the North landed on the coast of Sussex.

It is, however, but seldom that any real aid can be derived from tradition in estimating the longevity of trees. We have even to be on our guard against it especially when it associates the general claim to antiquity by a specific name or event. In the classical period, the tendency was as strong as it is still; and we should look to our own legends, when tempted to smile at the Delian palm mentioned by Pliny as coeval with Apollo, or at the two oaks at Heraclea as planted by Hercules himself. Pausanias, traveling in Greece in the second century of our era, saw a plane tree which was said to have been planted by Menelaus when collecting forces for the Trojan war, whence Gilpin gravely inferred that the tree must have been thirteen centuries old when Pausanias saw it. Tacitus calculated that a fig tree was 840 years old, because tradition accounted it the tree whereunder the wolf nursed Romulus and Remus. Nor was Pliny's inference more satisfactory, that three hollies still standing in his day on the site of Tibur must have been older than Rome itself, inasmuch as Tibur was older than Rome, and they were the very trees on which Tiburtus, the founder of the former, saw the flight of birds descend which decided him on the site

of his city. There is, of course, no more reason to believe in the reality of Tiburtus than of Francion, the mythical forefather of France, or of Brute, the Trojan, the reputed founder of the British Empire.

These things suffice to justify suspicion of trees associated with particular names, such as Wallace's oak, or trees claiming to have been planted by St. Dominic or Thomas Aquinas. Our only safe guide is measurement applied year by year to trees alike of known and unknown age, of insignificant as of vast dimensions, and recorded in some central annual of botanical information, facilitating the work of comparison, and the arrival at something like trustworthy averages. The experiment, moreover, has not been sufficiently tried, whether our oldest trees are capable of an increased rate of growth by the application of fresh earth around their roots, favorable though the case of the Tortworth chestnut is to the probability of such a result.

Thomas Meehan, who made an investigating tour in California, and as far north as Alaska, at a meeting of the botanical section of the Academy of Natural Science, stated that "there was nothing phenomenal in the great age of the mammoth *Sequoias*, as other trees on the Pacific coast exhibited great age." In order to ascertain whether more than one annual circle of wood is formed in each year, he tested the matter in various ways. For instance, a pine or spruce would be found to make an average growth of a foot a year up to 15 years old; from that on, 6 inches; after that, a stage was reached where the erect growth ceased to any considerable extent, and the growth force seemed turned towards the lateral branches. In the pine forests of the Pacific coast there was no danger of error in fixing the age of the average tree of 60 feet high at about 50 years. Whenever such a tree was cut down, and an opportunity afforded to count the circles, they would be found to correspond so nearly with the calculated age as to prove that it was quite safe to assume a single circle for a single year. Then there was a remarkable degree of uniformity in the diameter of these annual growths in most trees, so that when once we had the number of circular lines to an inch, and the diameter of the tree, we could tell its age near enough for general purposes. In some pine trees growing on very rich soil he had found as few as about 4 circles to an inch. For instance, a section of a *Pinus Lambertiana* in Mariposa, 4 feet across, had but 189 circles; but here the increased size of the trees correspond with the larger annual circles. Trees of this species of pine here measuring 30, and a few 33, feet round, were not uncommon. No matter, however, how vigorous may be the growth of trees under 50 or over 100 years, they decrease with age, and we may safely allow 6 rings to an inch in these older sugar trees, which would make the 33-foot tree 396 years old. The outer growths of *Sequoia* were very narrow; he counted as many as 18 to the inch, while the rings in the interior of cross-sections would show about 6 to the inch. Allowing 12 as the average per annum, a tree of 33 feet diameter would give 2,376 years old, which is about the same as given by an actual count of the rings.

At Harrisburg, or Juneau, in latitude 58°, a Sitka spruce (*Abies Sitkensis*) cut down gave 149 rings from center to circumference—298 lines in a trunk 3 feet across. This gave an average of about 8 to an inch in this 149-year old 3-foot tree. At Wrangel, at latitude 56° 30′, a tree of the western hemlock (*Abies Mertensiana*) which had been blown down, and afterwards divided by a cross-cut saw at 4 feet from its base, gave 18 lines to an inch, and the annual growths seemed very regular, almost to the center of the tree. It was 6 feet in diameter, and must have been a grand old tree in its day. It had evidently been broken off years before it was blown down, but the length of the trunk up to where it had been broken was 132 feet, and 4 feet in diameter at that height. But, allowing as much as 12 to an inch, it would give for the point cut across, 6 feet, an age of 432 years. At Kaigan Harbor, latitude 55°, the Sitka

spruces were very large and of great height. He measured two of the largest, which were 21 feet in circumference each. Allowing 8 to the inch, as in the tree of the same species at Harrisburg, it gives 336 years as the age of the tree. So far as appearances went, these trees were in the height of vigor, and there seemed no reason, judging from experience in other cases, why they might not flourish for 100 years yet. Mr. Meehan had no doubt that these trees in these latitudes in Alaska would easily have a life of 500 years.

Turning, now, to the Atlantic States, we find 200 years as the full average term of life for its forest trees, with the exception, perhaps, of the plane (*Platanus occidentalis*), which is the longest-lived of all. Trees famous for longevity in Europe are comparatively short-lived here. In the old Bartram garden near Philadelphia, and where the trees can be little more than 150 years old, nearly all are past their best. The English oak (*Quercus robur*), which in England is said to live for 1,000 years, has grown to full size and wholly died away in this garden, and the foreign spruces are on the down grade. The great cypress (*Taxodium distichum*), and which must have made an average growth of 4 lines a year, has also begun to show signs of deterioration. Silver firs (*Abies pectinata*), in the vicinity of Philadelphia, known to have been planted in 1800, are decaying. This is the general experience.

In seeking for the cause of this difference, we are accustomed to look at the relative humidity of the atmosphere of Great Britain and the Atlantic United States. Evergreens, like *Cerasus*, *Lauro-cerasus*, *Laurus nobilis*, and *Viburnum tinus*, which will endure a temperature of 25° below freezing point in Great Britain, are killed by 10° in Philadelphia, and, it is believed, by the drier atmosphere causing a heavier drain for moisture on the vital powers of the plant to supply. A strain which will wholly destroy plants in some instances must have an enervating influence where it does not wholly destroy, and this would naturally be exhibited in shortening the life of the tree.

The climate of Alaska has the same favoring influences found in Great Britain. The Warm Sea of Japan flows against its southeastern face, along which the trees referred to were found. The atmosphere is always moist, and severe weather almost unknown. At Sitka, in latitude 57°, as much as 100 inches of rain had fallen in a single year. The harbor was rarely frozen—boats came in and went out at all times of the year. There were some winters when no ice of any consequence was seen. These were circumstances favorable to longevity in trees.

Mr. Meehan concluded by remarking "that Dr. Lindley had said somewhere that his researches had failed to show that there was any period of duration of life set for any tree, and that, if circumstances favored, there seemed no reason why trees might not live for an indefinite period, and therefore arguments offered in connection with the 'wearing out of varieties,' based on what is called the 'natural life of a tree,' had little force." Mr. Meehan believed his observations on the longevity of trees on the Pacific coast confirmed Dr. Lindley's views. At any rate, "there seemed nothing phenomenal in the age of the *Sequoia gigantea*, as other species partook of similar longevity to a great extent."

While forced to admit that there is an end to all things, I am strongly inclined to the belief that, barring accidents, and with soil properties constantly kept up, the life of a tree is well nigh without end.

SPECIAL REPORT ON FORESTRY FOR CERTAIN PORTIONS OF OHIO AND INDIANA.

By R. W. FURNAS, *Agent of the Department.*

My object in asking and obtaining consent of the Department to visit certain portions of Ohio and Indiana in the interest of forestry, was to witness in person the results of tree planting and growing of actual known dates, ranging from 30 to 75 years, relating more particularly to maximum tree growth, age of wood maturity, and natural deterioration.

As connected with the subject of reproducing forests, the periods in timber cycles when a tree reaches maximum size and ceases to grow, when it commences to ripen or mature for useful purposes, and next, when actual decay or deterioration in value takes place, are of the utmost importance. To these I have given years of thought and attention, and seek further practical information. Recent brief visits and investigations were made with this object in view, and are herewith reported.

I visited middle-western Ohio, and middle-eastern Indiana. Trees were measured 2 feet above the ground and the circumferences given. To learn as nearly as might be the conditions of the wood, one-inch augur holes were bored from the outer surface to the inner center of trees, the shavings giving fair and close approximate and satisfactory indications.

LOCUST (*Robinia pseudacacia*).—99¼ inches; 75 years old; wood sound and free from borer ravages; well ripened and mature; solid and heavy as mahogany. To all appearance had ceased growing years ago.

SYCAMORE (*Platanus occidentalis*).—96 inches; 75 years old; sound, healthy, and in good growing condition. Evidently had not reached maximum growth.

COTTONWOOD (*Populus monilifera*).—99¼ inches; 56 years old; growing luxuriantly, and to all appearance in its prime.

SUGAR MAPLE (*Acer saccharinum*).—68 inches; 44 years old; 38 inches; 21 years old; healthy growing condition.

WHITE PINE (*Pinus strobus*).—Ohio, 56 inches; 30 years old; 48 inches; 30 years old. Indiana, 55¼ inches; 26 years old; 57¼ inches; 26 years old; conditions of the four measurements substantially the same; wood very soft and sponge-like, of little practical value, save, perhaps, for fuel.

CATALPA (*Speciosa*).—64 inches; 30 years old.

CATALPA (*Bignonioides*).—56 inches; 26 years old; both varieties of catalpa in good growing condition, not having reached the maximum size.

CHESTNUT (*Castanea Americana*).—67 inches; 26 years old.

SPANISH CHESTNUT.—33 inches; 15 years old; good growing condition; wood soft.

ELM (*Ulmus fulva*).—110 inches; 38 years old; indications that this specimen had ceased growing, and ripening commenced.

ELM (*Ulmus racemosa*).—68 inches; 30 years old; no indications that the maximum growth had been reached.

ELM (*Ulmus Americana*).—75 inches; 30 years old; conditions, substantially the same as next above.

ENGLISH OAK (*Quercus robur*).—40 inches; 30 years old; while this oak maintained solid characteristics peculiar to its kind, the wood, compared with well-ripened specimens, was immature and soft.

CAROLINA POPLAR (*Populus nigra*).—36 inches; 10 years old; this is the new variety introduced by the late Dr. Warder, some years since. It is valuable for quick growth, and resembles the common cottonwood. It is valuable, I know from experience, on open prairies. and grows readily from cuttings.

RED CEDAR (*Juniperus Virginiana*).—62¼ inches; 50 years old; in good growing condition, not having reached the maximum growth.

BALSAM FIR (*Abies balsamea*).—56 inches; 30 years old; soft and spongy.

NORWAY SPRUCE (*Abies excelsa*).—48 inches; 30 years old; soft and spongy.

In all trees examined where they had not reached a supposed maximum growth, the wood compared with well ripened specimens, was of soft sponge-like character possessing no durable qualities of value.

In Covington, Ky., opposite Cincinnati, Ohio, I found the city authorities using for street and gutter paving the common black locust (*Robinia pseudacacia*) after years' experience, and with most gratifying success. Almost any size from 3 inches in diameter upward was cut into 12-inch lengths, put down endwise, interstices filled with sand, and washed in with water through hose from hydrants. The durable and lasting properties of this variety of wood for purposes named is said to be wonderful by those who have experimented with it extensively.

As an item that may be of importance in the Department collections, I cite the following from official Ohio statistics for 1882, of manufactures from woods grown in that State:

	Value.
Wooden ware	$488,770
Cabinet	2,419,780
Carriages and buggies	6,012,985
Wagons and drays	580,159
All other articles	5,228,432
	14,730,126

REPORT ON THE FOREST CONDITION AND LUMBER AND WOOD TRADE OF NEW HAMPSHIRE AND WEST VIRGINIA.

By F. B. HOUGH, *Agent of the Department.*

NEW HAMPSHIRE.

New Hampshire was originally mostly covered with heavy forest growth, and the readiness with which the woodlands reappear upon abandoned fields is sufficient evidence of the adaptation of soil and climate to the growth of forest trees. On the tops of the highest mountains the trees must have been of very small size and thinly scattered if, indeed, they ever grew. None of these heights reach the level of the "timber line," as we should expect to find it in these latitudes; but the exposure to violent winds would of itself be sufficient to prevent the growth of trees, excepting in the more sheltered places. On the more elevated portions the spruces spread out low and flat, sloping with the ravines in which they grow, and presenting an extremely dense mass of interwoven branches.

The native forests were especially heavy and dense on the lowlands near the coast, when the country was first explored by Europeans, and pines of gigantic size flourished along the fertile intervales of the rivers and streams. The characteristic timber of the southern part consisted of the white pine, white oak, chestnut, white elm, white and black ash, basswood, walnut, white maple, hemlock, red oak, laurel, &c., following somewhat regularly the contour lines of elevation as the several species found conditions favoring their growth.

Towards the north the sugar and striped maples, beech, balsam fir, spruces, and northern white cedar or arbor-vitæ, became the prevailing kinds. The white spruce does not exist to great extent south of Connecticut Lake in the extreme northern part, but further northward in Canada it becomes more important than the black spruce. The latter is at present the principal timber tree of the Upper Connecticut Valley, in Vermont, New Hampshire, and the adjacent province of Quebec.

The "white cedar" (*Thuja occidentalis*) is chiefly found in upland swamps, and in certain regions it grows very densely and abundantly but not to a large size. It may be said generally that throughout the State the deciduous species preferred the dry and fertile uplands, while the conifers occupied the swamps and the mountain ravines. Along the coast the pitch pine and the red cedar were the characteristic trees the former preferring a sandy and the latter a stony soil, neither of them extending far inland and neither being of much commercial account. The "Norway pine" (*Pinus resinosa*) was more important but less abundant, occurring in clumps in the middle and southern parts of the State. The mountains of this State have suffered from forest fires which would sweep over their thin dry soil with great rapidity, not only killing and burning trees but consuming the vegetable constituents of the soil, and rendering the growth of another forest impossible until fer-

tility was restored. This could only be done by the slow process of decay of the minor herbage and bushes that first occupy the ground where it had been swept by these fires. In the deep muck of swamps the fires smoulder for a long time, but the destruction is not less sure and complete. In neither case do these fires cease their ravages until everything in their course is consumed or they are quenched by rains. The paper-birch having a very inflammable bark is very apt to be wholly consumed. The living evergreens, if large, may not be burned, but their roots are weakened, and they remain for a time as dead blackened trunks of trees until thrown down by the winds, and thoroughly prepared to feed the next passing fire. An instance at Stratford is mentioned where the lightning started a forest fire, but these are very unusual, the common origin being the carelessness of hunters and camping parties, the wanton mischief of thoughtless boys, or the sparks and coals of locomotives. The northern boundary glade four rods wide, cut out in 1845 and not burned, was opened through evergreen forests and grew up with deciduous trees, cherry and mountain maple being the principal kinds; and among these the spruces are gradually coming in to regain their former ground. Where fires kill off a spruce forest the first growth is the aspen-poplar, birches, and cherry, but sometimes not until the ground has been in some degree prepared by the herbage and bushes of humble growth.

Where only the large timber is taken and fires are prevented, there is no difficulty in maintaining the succession, especially in the spruce, for an unlimited time. There are always some sprouts too small for the wood-cutter's notice, and when these are exposed to the full light of day, they promptly come forward and soon cover the whole surface with a fresh growth. Certain of the deciduous species when cut off sprout vigorously from the roots and stumps in the southern part of the State, but seldom in the northern.

The reappearance of woodlands where there have been cultivated fields is much more common in the southern part of the State, and perhaps this is more noticeable between the Connecticut and the Merrimack Rivers where farms unproductive from long tillage are often found springing up in woodland. The growth is generally very dense, and the result is much less productive than it would be if proper care were taken to thin out these thickets and allow the more profitable kinds only to remain. As there is a considerable diversity of species, this would enable the owner to turn his land to much better account than would be possible where this thinning is neglected.

It has been noticed here as everywhere that the completion of a railroad through a wooded section is the beginning of destruction to the native forests, partly from the outlet thus afforded for wood and lumber suitable for market, and partly from the forest fires that are almost sure to follow. These injuries are always more liable to occur in an evergreen forest from the greater inflammability of the rubbish upon the ground, and partly to the greater dryness of the soil itself, which does not hold moisture so long as where covered by deciduous leaves.

An intelligent correspondent, who has made the subject of woodlands a special study in this State, in speaking upon forestry in general, says:

In Southern New Hampshire forest clearing is going on at a rate which will deprive the land of all supplies suitable for the arts within twenty years. Very little of the primitive forest is left, and the older second growth is well culled. The natural consequence of this is that they now make use of timber which was rejected ten years ago. Cheshire County has probably more available wood and timber than Hillsborough, Rockingham, and Merrimack combined. The whole country was origi-

nally covered with woods. The white pine, chestnut, cherry, oak, maples, birches, and ashes, seem most likely to take the place of forests cleared and allowed to grow again; the spruce, hemlock, and beech, formerly so abundant along the Connecticut and Merrimack watershed, seem less likely to hold their own.

The first clearings were to gain land for agricultural purposes only, the timber being all burned. This is not so frequently done at the present time, the wood and timber being the principal object in the clearing. At the present rate of cutting, the growing forests are wholly inadequate to meet the wants of the near future, especially in the eastern part of the State.

In speaking of Cheshire County, in particular, he remarks:

This county may have, including all sprout-lands, and the abandoned farms in the towns farthest from the railroads, fifty per cent. of the area in young woodlands. In Eastern New Hampshire the proportion is probably much less.

Returning to more general remarks concerning the State, he says:

It seems very necessary that the area of forests in New Hampshire should be increased, both to meet the wants of the future in timber and fuel, as well as to keep up the water supply. The very severe droughts in the State within the past two seasons point to the fact that the safety line has already been passed. The question of the preservation of forests in New Hampshire, and of the increase of their area, is one of first importance to the State, and is one to which the authorities are very indifferent. The legislature of 1881 created a commission to investigate the subject, of which I had the honor to be appointed a member; but as it made no provision for the necessary expenses for the collection of facts very little was done, the members feeling that they could not give their time and pay their expenses besides. The legislature of 1883 extended the commission, and appropriated a small sum for the necessary expenses of investigation, so that there is now a hope that more will be done to set the subject in its true light before the people within the next two years.

More care is now taken of the remaining woodlands than a few years ago, it is true, but not enough to prevent increasing waste. New Hampshire is as well adapted to forest-culture as any State in the Union. In many respects it is better, for much of its area will produce a heavy crop of timber, while it is too rough and rocky for successful tillage. I have heard of but few instances of artificial planting. There is one in the town of Winchester, by Mr. A. L. Jewell—a white-pine grove of about 2¼ acres, on which seeds were sown about thirty years ago. The trees have been kept carefully pruned and thinned, and it is now the admiration of all who see it—yet no one goes and does likewise.

The white pine is considered the quickest growing and most profitable tree we have; but the white oak, white ash, sugar maple, basswood, red and black oaks, hickories, chestnut, black cherry, &c., will all grow rapidly and pay well for planting. Black walnut does not grow naturally here, yet from what I have seen from occasional specimens artificially planted, I am satisfied it would be one of the most valuable trees for lumber that could be grown in Southern New Hampshire, in any soil that would grow the butternut. I shall try to experiment by planting a quantity of the nuts this fall.

Forest fires are not very common in the southern part of the State, considerable care being taken to control them when started.

The question of the proper age for cutting timber has scarcely been considered in this State, as very little of the second growth has been allowed to arrive at maturity.

THE SHIP-BUILDING INTEREST IN NEW HAMPSHIRE.

We have an indication of the former importance of this industry in this State from the design upon its great seal, which represents a ship upon the stocks. At an early period, the supplies of white oak, white pine, and other timber employed came from the State itself. As these supplies failed, the materials were brought from more distant sections of the country, and in later years the States bordering upon the Chesapeake have supplied the oak, and the Atlantic States farther south the pine.

The number and class of vessels built at Portsmouth (the only ship-building point in the State), through a series of years, is given in the following table:

Number and class of vessels built at Portsmouth, N. H., during the several fiscal years, from 1844 to 1882, with their total and average tonnage in each year.

Fiscal years ending in—	Number.	Tonnage.	Average tonnage.	Fiscal years ending in—	Number.	Tonnage.	Average tonnage.	Fiscal years ending in—	Number.	Tonnage.	Average tonnage.
1844	3	754.88	251	1857	9	8,718.19	957	1870	4	2,486.86	622
1845	5	2,501.08	500	1858	6	5,075.77	846	1871	3	1,207.83	402
1846	8	2,171.08	271	1859	6	3,846.41	641	1872	0	.....	.....
1847	10	5,288.48	529	1860	5	3,808.03	762	1873	1	378.75	379
1848	9	5,326.33	592	1861	10	4,605.43	460	1874	3	3,182.88	1,061
1849	12	6,265.89	522	1862	1	189.76	190	1875	2	1,585.12	722
1850	10	6,914.32	691	1863	2	563.50	281	1876	5	1,702.59	340
1851	7	8,158.06	1,165	1864	5	3,510.88	702	1877	8	94.22	11
1852	14	9,815.22	601	1865	4	824.43	206	1878	4	2,972.82	743
1853	10	8,696.11	867	1866	14	4,024.57	287	1879	2	518.65	259
1854	11	11,980.12	1,089	1867	2	1,529.45	765	1880	0	.....	.....
1855	11	8,928.24	812	1868	13	5,549.47	424	1881	0	.....	.....
1856	10	10,395.08	1,039	1869	1	69.43	69	1882	0	.....	.....

This table does not include the operations of the Portsmouth navy-yard, which is located upon an island adjacent to the harbor, but within the State of Maine.

Portsmouth has never been a point of any importance for the exportation of forest products; indeed, it scarcely appears in the annual reports in the tabulated statements of the various classes of wood products. It was not until the completion of railroads that lumber in any form was sent out of the State, except such as floated upon the Connecticut River. Whatever else may have been disposed of has been consumed within the State, or destroyed in clearing the land for agricultural purposes, or by forest fires.

Number of saw-mills in New Hampshire.

Counties.	In what part of the State.	Number of saw-mills.	Principal kinds of timber sawn.
Belknap	C.	14	White pine, spruce, hemlock, and hard wood.
Carroll	C.	27	Pine and hard woods.
Cheshire	SW.	41	Spruce, pine, and hemlock.
Coös	N.	36	Spruce, pine, and hard woods.
Grafton	C.	119	Pine, spruce, hemlock, and hard woods.
Hillsborough	S.	16	Pine, spruce, and hard woods.
Merrimack	S.	36	Pine, spruce, hemlock, and hard woods.
Rockingham	SE.	44	Pine, spruce, hemlock, and hard woods.
Strafford	SE.	21	Pine, hard, and soft woods.
Sullivan	SW.	49	Pine, spruce, hemlock, and hard woods.

Of the 434 saw-mills above reported, 90, or 21 per cent., use steam power; 22, or 5 per cent., use both steam and water power, and the remainder use water power. Planing-mills are connected in 233 of them.

Places in New Hampshire that have six saw-mills or more, with their location, and the principal kinds of lumber sawn.

County.	Place.	Number of saw-mills	Principal kinds of timber sawn.
Carroll	Moultonville	7	Pine and hard woods.
Cheshire	Keene	6	White pine, hemlock, and spruce.
Coös	Colebrook	12	Spruce, pine, and hard woods.
Do	Lancaster	8	Spruce, pine, and hard woods.
Grafton	Alexandria	8	Pine, spruce, hemlock, and hard woods.
Do	Canaan	8	Pine, spruce, hemlock, and hard woods.
Do	Easton	6	Pine, spruce, hemlock, and hard woods.
Do	Orford	6	Pine, spruce, hemlock, and hard woods.
Hillsborough	New Boston	11	Spruce, pine, and hard woods.
Rockingham	Candia Village	6	Pine, spruce, hemlock, and hard woods.
Sullivan	Cornish	7	Pine and hard woods.
Do	Claremont	6	White pine, hemlock, spruce, and hard woods.

LEGISLATIVE ACTION IN NEW HAMPSHIRE.

JOINT RESOLUTION authorizing an inquiry concerning the destruction of forests, and the wisdom and necessity of forest laws. Approved July 29, 1881.

Resolved by the senate and house of representatives in general court convened, That the governor and such associates as he may appoint to act with him are hereby constituted a commission to institute an inquiry into the extent to which the forests of New Hampshire are being destroyed by the indiscriminate cutting of wood and timber for transportation to other States. Also, into the effect, if any, produced by the destruction of our forests upon the rainfall, and consequently upon our ponds and streams, and into the wisdom and necessity for the adoption of forest laws. Said commission shall serve without compensation or expense to the State, and shall make a report to the legislature, which shall be prepared at least sixty days before the session of June, 1883; and the State printer shall print for public distribution of said commission as many copies of such report as the commission may order.

Governor Charles H. Bell, then holding the executive office, nominated as his associates, Judge William S. Ladd, of Lancaster; Prof. H. G. Jessup, of Dartmouth College (Hanover); Mr. Joseph Barnard, of Hopkinton; Mr. Ithiel E. Clay, of Chatham; Mr. William F. Flint, of Winchester, and Mr. William H. Hill, of Claystone.

The preparation of a report in readiness for the June session of the legislature in 1883 was not accomplished, probably on account of the absence of an appropriation to meet the necessary expenses for effective inquiry. The Hon. William S. Ladd, of Coos County, one of these commissioners, who has taken a deep and intelligent interest in this subject, issued at private expense, near the beginning of 1883, a circular of inquiries, of which the following is a copy:

LANCASTER, *January* 8, 1883.

DEAR SIR: By a joint resolution of the legislature of 1881, his excellency the governor, and such associates as he might appoint, were constituted a commission to inquire concerning the destruction of forests, and the wisdom and necessity of forest laws, &c.; said commission to serve without compensation or expense to the State, and report to the next session of the legislature. I have had the honor to be appointed upon said commission, and in that behalf take the liberty of addressing to you this circular, requesting information. The subject is acknowledged by all to be one of vast importance, and is especially interesting to the people of our part of the State.

The co-operation and assistance of practical men of every pursuit, and more especially, perhaps, of those engaged in lumbering operations, are very desirable, in order that such suggestions as the commission may make, with a view of legislation or otherwise, may be sensible and practical, while at the same time they do no injustice to any class of business. It is with the above view that you are earnestly requested, at your earliest convenience, to send to me for the commission as full answers as you can to the following questions, it being made my duty to collect this information respecting the counties of Grafton and Coos:

1. What amount of timber was cut in your town in the winter of 1881–'82, and what is your estimate of the amount to be cut the present winter?
2. What proportion of said timber, manufactured or unmanufactured, has gone, and is to go, out of the State for a market?
3. What number of acres does the cutting of the two winters clear?
4. Estimated number of acres cleared during the two winters referred to, by cutting the growth into cord-wood, or otherwise than for timber?
5. What is the acreage of forest and of cleared land in your town?
6. What method can you suggest to protect our forests against fire?
7. What is the effect of the removal of the forests upon the water-supply, and the condition of our ponds and streams, and what has been its effect during the period covered by your observation?
8. What definite fact or facts can you state as to the drying up of ponds or streams, resulting from the removal of the forests?
9. Any other fact or suggestion which you think will promote the object of the commission.

Yours, very truly,

W. S. LADD.

OTHER OFFICIAL ACTION IN NEW HAMPSHIRE.

Governor Samuel W. Hale, in his annual message delivered June 13, 1883, after speaking of the importance of mountain roads, said:

In this connection, also, I desire to call the attention of the legislature to the continued and enormous destruction of our forests, which is proceeding, according to the best information I have been able to obtain, at a more rapid rate than heretofore. There is little doubt that it is affecting the rainfall in our State and the steady supply of the headwaters of those streams and reservoirs which furnish motive power for many of our great industries. The sale, a few years ago, of the public lands, seems now to have been a great mistake, for it has deprived the State of a control over this matter that it may not be easy to regain. A commission to consider this important subject was appointed by the last legislature, and its report will be duly laid before you. All other remedies failing, it may be necessary for the legislature to establish regulations for the preservation of the forests of the White Mountain section, or it may be necessary to acquire a control of this section, which will enable us to preserve it for a natural public park, not only for ourselves, but for the rest of the country.

The reference made in the above extract to the mistake made in the sale of public lands may need further explanation. In the autumn of 1867, three sales of the State lands were made by the authorities then in power, which included the last of the woodlands that remained. They were as follows:

1. A circle having a radius of 3 miles upon Mount Washington, having the hotel upon the summit as its center. It contained 2,000 acres, more or less, and was sold in October of that year for $5,000.

2. A tract of wild land supposed to contain 70,000 acres, in the town of Pittsburg, in the extreme northern part of the State, in Coos County, for the sum of $20,500.

3. A tract of wild land, supposed to include 100,000 acres, more or less, in Grafton, Carroll, and Coos Counties, November 5, 1867, for $4,000.

Thus, for the sum of $29,500, the title was conveyed to timber lands which would now readily sell for more than $500,000, and which at no distant future would undoubtedly be worth more than twice this sum. The governor may well speak of this transaction as a "great mistake"; but to realize the full meaning of this term, it should be added that by far the greatest portion of the marketable lumber upon these tracts has been floated down the Connecticut River to mills in Massachusetts and Connecticut, yielding to the State of New Hampshire, where it grew, neither revenue nor benefit in any form whatever. It might be said by some that its inhabitants would at least get the benefit of the wages paid for labor in the cutting and removal; but this would be another mistake, because much of this labor is performed by Canadians, and these frugal and hardy people carry home the greater part of their earnings at the end of each working season.

SOME IMPORTANT LUMBERING OPERATIONS.

It is understood that the Connecticut River Lumber Company, organized February 5, 1878, with a capital of $250,000, is at present the owner of a considerable amount of the remaining timber lands of Northern New Hampshire, and that their lumbering operations are much the most extensive upon the river, their mills being at Holyoke, Hartford, and other points below. We are not informed as to the location of their lands, nor whether the land sales above mentioned are included in their property.

Some portion of the timber floated down the Connecticut comes from

the northeastern corner of Vermont, and a little from Canada, but the greater part comes from Coos County, in New Hampshire. The principal operations in 1883 were said to be in the town of Colebrook, and in the region around Connecticut Lake.

Besides the timber thus floated to market, the railroads here, as in other sections of the country, have afforded the means for getting out lumber from places where it could not be obtained without much expense by other methods. One of these is the Whitefield and Jefferson Railroad, about 10 miles in length, which brings down large quantities of logs to the mills at Whitefield. One or two other lines recently constructed or under consideration have been mentioned as intended to be employed in the lumber business.

Timber areas of New Hampshire, as reported by the census.

Counties.	1850.		1860.		1870.		1880.	
	Total area.	Area unimproved.	Total area.	Unimproved.	Total area.	Unimproved.	Total area.	Unimproved.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Belknap	210,932	67,408	232,048	83,234	211,544	56,123	235,913	68,776
Carroll	295,474	142,843	357,303	178,333	448,014	271,823	348,807	168,232
Cheshire	373,690	94,993	358,161	97,932	340,580	80,400	413,873	180,028
Coos	203,563	113,224	335,933	221,113	238,433	117,559	261,093	122,004
Grafton	604,835	263,600	695,603	258,762	704,099	261,361	713,707	287,923
Hillsborough	428,776	111,482	444,615	134,825	397,564	113,690	450,770	149,618
Merrimack	411,538	123,429	473,796	146,410	462,775	126,893	485,805	180,523
Rockingham	339,055	102,986	359,343	121,240	356,837	121,232	345,535	121,991
Strafford	184,855	48,629	194,525	60,951	158,170	55,758	184,619	59,532
Sullivan	279,696	72,242	293,208	74,792	287,978	60,668	281,022	75,034
Total	3,392,414	1,140,926	3,744,625	1,377,591	3,605,994	1,271,507	3,721,173	1,413,661

CENSUS ESTIMATES OF 1880.

The merchantable supply of standing timber (spruce and white pine) in the State of New Hampshire was estimated in the census of 1880 as follows:

Spruce:	Feet.
Carroll County	60,000,000
Coos County	1,000,000,000
Grafton County	450,000,000
Total	1,510,000,000

There had been cut during the preceding year (including 26,000,000 feet sawed on the Connecticut River, in Massachusetts) 153,175,000 feet.

White pine.—The original forests of this timber were reported as practically exhausted. Considerable areas formerly occupied by the white pine, especially in the southern part of the State, had grown up again with this species.

No estimates of the amount of this second-growth pine had been made, although it furnished a cut during the census year of 99,409,000 feet, board measure.

It was roughly estimated that the spruce forests of the State contained over 33,730,000 cords of hard wood and 165,000,000 feet of hemlock.

Comparing the returns of former periods, we find the percentage of area of "unimproved land" in farms to have been 31.63 in 1850, 36.38 in 1860, 35.26 in 1870, and 37.97 in 1880.

AREAS BY COUNTIES—WOODLANDS AND OTHER UNIMPROVED.

In 1870 and 1880 the "unimproved" lands were subdivided into "woodlands" and "other unimproved," and the areas of each class in farms were reported by counties as follows:

Counties.	1870.			1880.			Percentages.			
	Total.	Woodland.	Other unimproved.	Total.	Woodland.	Other unimproved.	Woodland.		Other unimproved.	
							1870.	1880.	1870.	1880.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*				
Belknap	211, 544	53, 544	2, 579	235, 943	66, 393	2, 883	25. 31	28. 13	1. 22	1. 01
Carroll	448, 014	151, 164	120, 659	348, 807	158, 019	10, 213	33. 74	45. 30	26. 93	2. 93
Cheshire	340, 580	72, 073	8, 327	418, 873	165, 248	14, 780	21. 17	39. 92	2. 44	3. 57
Coos	238, 433	112, 529	5, 030	261, 093	116, 242	5, 762	47. 19	44. 52	2. 22	2. 20
Grafton	704, 099	230, 309	31, 052	713, 706	257, 886	30, 037	32. 71	36. 13	4. 41	4. 21
Hillsborough	397, 564	92, 084	21, 606	450, 770	138, 279	10, 739	23. 16	30. 61	5. 43	2. 38
Merrimack	462, 775	124, 211	2, 682	485, 905	161, 088	19, 435	26. 84	33. 16	0. 58	4. 00
Rockingham	356, 837	97, 105	24, 127	345, 535	104, 965	17, 026	27. 21	30. 36	6. 76	4. 94
Strafford	158, 170	49, 739	6, 019	184, 619	56, 039	3, 493	31. 44	30. 35	3. 80	1. 89
Sullivan	287, 978	64, 332	2, 336	281, 022	72, 370	2, 664	22. 35	25. 75	0. 81	0. 95
Total	3, 605, 994	1, 047, 090	224, 417	3, 721, 173	1, 296, 529	116, 532	29. 04	34. 84	6. 22	3. 13

ANCIENT TIMBER REGULATIONS IN NEW HAMPSHIRE.

It may be of interest in this connection to notice some of the reservations, restrictions, and penalties enacted in colonial times, with reference to timber in the region now included in this State.

In settling the bounds of Exeter, by a committee appointed in 1667, it was provided that all pine trees, fit for masts, which were 24 inches and upwards within 3 feet of the ground, that grew above 3 miles from their meeting-house, should be reserved for the public; and that if any person or persons should presume to fall down any such pine tree fit for masts, he or they should forfeit £10 for every tree, one-half to the informer, and the other half to the public treasury of the county. This was not to infringe upon a certain grant of 250 acres previously made.*

The following draft of a letter prepared for His Majesty's signature, to the Earl of Bellomont, will show the importance attached to the subject at the beginning of the last century:†

Whereas we have been informed that great spoils are daily committed in the woods of New Hampshire and the province of Maine, and other parts within our Government of the Massachusetts Bay, by cutting down and converting to private uses such trees as are or may be proper for the service of our Royall Navy, and it being necessary that all practices which tend so evidently to deprive of those supplies be effectually restrained: Our will and pleasure is that upon consideration of the occasions of such abuses, the methods by which they are carried on, and the inconveniences that attend them, you use your endeavors with our respective councils and the General Assemblies of the Massachusetts Bay and New Hampshire, to dispose them to pass acts for preventing the further spoils of those woods, for preserving a nursery of such trees as may be useful for our service; and in case you cannot prevail with them to pass acts proper and sufficient for these purposes, that you send over hither the heads of such a bill as may be effectual for those ends, and fit to be enacted here. So we bid you heartily farewell.

Given in our court at Hampton Court, the 19th day of January, 1700–1, in the twelfth year of our reign.

By His Majesty's command.

JAMES VERNON.

*Provincial Papers of New Hampshire, i, 303. †*Ib.*, ii, 338.

The connection of John Bridger with the early operations of getting out timber and naval stores from the forests of New Hampshire deserves a notice of his character and of the result of his enterprise.

He was a ship-builder by trade, and served his time in the King's dock-yard at Portsmouth. Some time in 1697 he was appointed, with Benjamin Furzer, by the admiralty and naval boards, to make a survey of the woods and other conveniences in the colonies for producing naval stores. A Mr. Jackson, appointed by Sir Henry Ashurst, was associated with them, and were shipped on board the Deptford by an order of the admiralty, and forced to land in Barbadoes. There Furzer and Bridger fell sick of a fever from a debauch, and the former died. The latter followed the Earl of Bellomont to New York in 1698, and he was sent to Boston to look after the business of his appointment.

In the fall of 1699 he sent a ship-load of specimens of timber to England on the King's account, and this, so far as we can learn, was the first of any systematic attempt to obtain these supplies from America.* The Earl of Bellomont, referring to the undertaking, speaks of the alarm among the Eastland merchants in England at the talk of late in London of furnishing naval stores from the English plantations in America, and says that he believes they would oppose that design as in them lay, adding:

> And also the specimens of tar and ship-timber sent to England by Mr. Bridger were not without enemies that decried and run them down; but your lordship's wisdom and integrity will easily stem all sinister defamations.

In this same letter the writer gives some information upon the sizes and prices of lumber at that period, which has permanent interest:

> The deals brought from Norway are sold by tale, that is, by the hundred, and the price is from £3 10*s.* to £5 the hundred, their length being from 10 to 12 feet, their breadth from 10 to 12 inches. In New Hampshire they sell their boards by the 1,000 feet; 22*s.* per 1,000 is the present price for such deals. The boards are rarely under 25 feet in length and from 15 to 18 inches in breadth, and more free from knots than the Norway boards are, as they tell me here. When the deals are 2 inches thick they call them plank, and their rule is to double their price as the thickness of the board or plank doubles; for 2-inch deals they have £2 4*s.* per 1,000 feet, and for 3-inch deals £3 6*s.*, and the advantage of the merchant or fraughter will be chiefly in the 2 and 3 inch deal plank for the decks of ships, and such plank they saw in New Hampshire 36 feet long and 2 feet broad, and upon occasions they can furnish plank that is longer and broader than even that.

He goes on to state that a fly-boat of 500 tons will carry 270,000 feet of inch deal and a good number of pieces for spars and oars, and points out the economy that would be gained in employing the King's ships in their transportation, instead of hiring it done upon private ships.

The next incident in Bridger's career of interest to New Hampshire is a letter addressed to the governor and council, setting forth some of the difficulties which he had to encounter:

> HONORABLE SIRS: In May, June, and July last I prepared a great many thousand trees in order to make tar for the use of His Majesty, in the river of Piscataqua, particularly on the commons of Dover, on that side next to Suhawannick River, and in the woods next Quamphegan Mill, and in the woods by John Wingett's, and on a point below the house of William Henderson, sr.; all which lands were the commons of the adjacent towns, and not fenced where the said trees were prepared.
>
> Notwithstanding His Majesty has been at the charge of preparing said trees for his use—as by an act of the Assembly every one may improve any of the common land or its produce, more particularly I presumed His Majesty might, when no injury to the subject—yet some envious, malicious, and unthinking people have felled many of the said trees which I prepared, to the great disappointment of the project I am on, and His Majesty's interest at home as well as here.
>
> Such little and litigious actions makes me doubt but the trees that were burnt was by design. I am sure this is an introduction to such belief.

* Colonial History of New York, iv, 593.

I therefore make these unlawful actions known to you, which neither increase the actor's interest, nor does it blazon your loyalty, except by punishing the offenders, which done, will prevent my asking redress from other places or persons; otherwise must seek to put a stop to such proceedings by the best and momentous care I am capable of. I shall wait your answer before I say to any else,

Your Honor's humble servant,

J. BRIDGER.

BOSTON, January 21, 1700–1.*

To this letter, with its implied menace and direct censure, the following answer was given:

PORTSMOUTH PROVINCE, *Feb.*, 1700.

Mr. JN. BRIDGER:

I am commanded by the lieutenant-governor and council to let you know they have received your letter of 21st January last, importing a complaint against sundry unknown persons for felling of trees prepared by you for making tar for His Majesty's use, with a suspicion that other trees lately burnt were done by design, together with a reflection on their honor's loyalty, to which they have ordered me to give answer as follows: That they much admire at your different sentiments concerning the government of this province from what they were at your first coming hither, when you could not but justly acknowledge their abundant readiness to promote His Majesty's service and interest, particularly in that affair under your management, even far beyond what you met with in the Massachusetts government. And for any persons offending according to your complaint, they think it your duty to prosecute such offenders, that they may receive condign punishment according to their demerits; and they will on their parts in nothing be wanting to prevent any prejudice to His Majesty's interest therein; and wish you may be able to give His Majesty as good an account of your negotiation in this his service as they shall be of their loyalty when called in question. This is all at present.

By order of the lieutenant governor and council.

C. STORY, *Secretary.*

The Earl of Bellomont, in writing to the lords of trade (June 22, 1700), thus speaks of the timber business as it then was:

The waste of the woods in New Hampshire has been, and still is so very great, that Mr. Bridger assures me they are forced to go 20 miles up into the country to get a good mast for the use of the Navy.

He refers to various practices employed, and among others, shipment of valuable timber to Portugal, and advises the passage of an act imposing heavy penalties against sending ship timber or lumber to a foreign country, and for compelling the merchants to carry the timber to England, or other places within the King's dominions only. He adds:

A great many other regulations ought to be, which I submit to better judgments than my own, but one thing I must not omit to recommend, and that is, that a clause be inserted in the act *which shall oblige everybody that cuts down a tree to plant four or five young trees in its stead.*

He advises that none should be allowed any property in the woods otherwise than as a common tenant right, each one being allowed to cut and carry away so much as he had need for, upon paying the cost of cutting, and of planting four or five young trees in the place of each one cut down. There should be a restraint upon all persons, under a heavy fine, from cutting trees marked for the Navy, and he says: "Several other clauses will be necessary, as for example, no trees to be cut when the sap is in the root. Therefore the penning of such an act will require great care."† As to the dimensions of the timber sent to England at this period, the Earl of Bellomont, under date of November 23, 1700, speaks of masts 35, 36, 37, and 40 inches in diameter, and mentions the latter as something that will be a rarity there. He was told last year

*Claimed to be about 8,000 in number, all of which were maliciously burned. Letter of June 22, 1700. (Colonial Hist. of N. Y., iv, 678.)

†Colonial History of New York, iv, 675.

at Piscataway that never but one mast of 40 inches had been sent from thence to England, and that 37 inches was the most that had been mentioned in contracts.

In another letter, dated January 9, 1700–1,* he says:

> They have got about forty mills up in this Province [New York], which I hear rids more work or destroys more timber than all the saw-mills in New Hampshire. Four saws in New Hampshire that work in one mill, and here is a Dutchman lately come over, who is an extraordinary artist at those mills. Mr. Livingston told me last summer he had made him a mill that went with twelve saws.†

On the 18th of October, 1706, Queen Anne granted a commission to Mr. Bridger as "surveyor-general of all and singular our woods within all and every our plantations in the continent of America," and requiring him to instruct in the making of pitch and tar, raising and curing of hemp, and all matters relating to the production and manufacture of naval stores. He was to mark and reserve all trees fit for the use of the navy, and keep a register of the same, rendering semi-annual accounts of his proceedings to the admiralty.‡

In 1710 Governor Hunter, of New York, undertook to establish a large number of Palatine settlers upon the Hudson, to be employed in making tar, and he took Bridger into his councils, as one supposed to be competent to instruct. The latter made inflated promises, which only ended in disappointment. His salary was raised from the £200 fixed by his commission to £300, but without bringing any result. In short, after endless complaint, we find the governor expressing the utmost distrust of his qualifications for the business, or for his honesty as a man, and in his letter to the lords of trade accusing him of basely deserting him and of betraying his trusts.

A Mr. Richard Sacket, who had spent three years in the Eastland [Norway and Sweden] was employed to give instruction in the art of tar-making, and for the next ten years we find occasional mention of Bridger as a fraud and villain. He became particularly odious in Maine from his attempts to prevent the cutting of pine trees by owners upon their own land. He was accused of accepting money from persons for leave to cut masts, which was refused to others who declined to pay him bribes. The house of representatives of Massachusetts complained of him to Governor Shute, who, however, protected him, and he remained in office until 1729, when he was succeeded by Colonel Dunbar, afterwards governor of New Hampshire.§

In following this subject down through a later period it will be found that restrictions upon the cutting of timber suitable for the navy were continued to near the end of the colonial period, and that they often caused irritation from the manner in which the law was administered, with respect to private lands. On the 21st of February, 1743, Governor Benning Wentworth, of New Hampshire, was appointed surveyor-general of His Majesty's woods in North America.

REPLIES TO INQUIRIES BY LUMBER MANUFACTURERS IN NEW HAMPSHIRE.

With the view of obtaining the opinions and advice of those actually employed in the manufacture of lumber in various forms in this State, a circular was addressed to each person or firm engaged in the business,

* Colonial History of New York, iv, 779.
† *Ib.*, iv, 825.
‡ Provincial Papers of New Hampshire, iii, 334.
§ Hutchinson's Hist. of Mass., ii; Williamson's Hist. of Maine, ii; Colonial Hist. of New York, iv, v.

as found in a business directory. This circular, after briefly stating the object of inquiry, in order that the motive should not be misunderstood as relating to a speculative or other business purpose, presented several distinct questions, to which a reply was requested. These included:

1. The nature of the business reported—whether saw, shingle, stave, or other mill or factory, using timber or wood from the forest as first or stock material.

2. The amount of logs or timber (estimated in board-measure) used in the year 1882.

3. The amount as estimated for 1883.

4. The average number of logs required for making 1,000 feet of boards.

5. The production in kind of the several products, as boards and other sawn lumber, laths, shingles, staves, or other products, for the two years above mentioned.

6. Suggestion or information with regard to the origin and extent of forest fires, and as to their prevention and control; with any further advice that might be given relative to the maintenance of woodlands, or other subjects of utility in reference to forest supplies.

7. The dimensions or limit of least size observed, if any, in the sawing or manufacture of lumber.

8. The kinds of timber chiefly used in the business, and the relative amount of each.

9. Miscellaneous remarks, including under this head any facts noticed as taking place tending to the injury of the woodlands, whether from insects or other causes; together with any suggestions that might be deemed of interest, upon the subject of forestry generally.

The replies to this circular were far from being complete—partly, perhaps, from mistaken address, or in some cases a discontinuance or change of business, that left nothing to report. Answers, however, were returned from 160 of them. These, although not sufficient to afford the basis of a calculation as to the quantities of lumber manufactured in the State, nevertheless contained many important facts and suggestions, which have been classified so far as the nature of the returns would admit, and are given in the following pages.

It will be seen that much the greater number speak of rapidly failing supplies, and not a few of needless waste, and an utter disregard for the wants of the future. As they allude to customers bringing logs to their mills not more than 4 inches in diameter, and that will not make more than 10 feet of lumber to a log, they may well compare it to "the cutting up of corn in June for fodder."

AMOUNT OF LUMBER MANUFACTURED.

Belknap County.—The mills reporting manufactured from 50,000 to 150,000 feet of boards and from 150,000 to 225,000 shingles. The amount in 1883 was the same as in 1882 in two cases; it was increasing in one and decreasing in three cases.

Carroll County.—One return estimates that three years will clean out all the timber in the town of Ossipee. The mill reported 1,200,000 feet in 1882 and 1,300,000 in 1883, and there were others as large in town. The amount produced in 1883 was in most cases greater than 1882 in the case of sawn lumber and less in the case of shingles.

Cheshire County.—Much of the wood-production of this county consists of staves, chair-stuff, pails, shingles, &c., as well as considerable quantities of sawn lumber. It is noticed that nearly all of the returns show an increase of from 20 to 50 per cent. in 1883 over the amount produced in 1882.

Coos County.—The amount of lumber manufactured in Coos County bears but a small percentage to the amount that is floated down the Connecticut River for sawing in Massachusetts and Connecticut. The amount thus floated, chiefly spruce, ranges from 75,-

000,000 to 90,000,000 feet a year. So far as the returns are made in answer to inquiries, it would appear that the amount produced by local mills in 1883 was no more, and in several instances less than in 1882.

Grafton County.—About half of the returns from this county indicate an increase of production, averaging about 50 per cent., while in the remainder it was the same in 1883 as in the year previous. The products, besides lumber and framing timber, consisted of shingles, staves, tubs, buckets, &c., and a considerable amount of small square stuff for bobbins. Several establishments reported "half hard and half soft wood," the latter being specified as pine, spruce, hemlock, and bass-wood.

Hillsborough County.—In 16 cases the amount of lumber sawn in 1883 was in excess of that in 1882; in 10 cases it was less, and in 7 cases the same. Of staves, shingles, and other lumber products, the amount was increasing in 11 cases, decreasing in 6, and stationary in 8. A considerable supply of cooper-stock, chair-stuff, and other articles is made, the amount being relatively large as compared with sawn lumber. The establishments are generally small.

Merrimack County.—In a majority of instances the amount of lumber produced in 1883 was reported the same as for the year previous. One establishment used up 80,000 feet of birch, for pail-handles, making 7,000 boxes of 500 each. Clapboards, chair-stuff, and cooper's stock form considerable items of production.

Rockingham County.—The returns from this county were quite numerous, but from small establishments, the largest being 2,000,000 a year with a portable mill. The product is principally sawn lumber, with a considerable amount of small cooper-stuff for kits and pails, and some lath and small stock for chairs, carriage-making, &c. One establishment made 5,000 elm hubs in 1882 and 8,000 in 1883.

Strafford County.—The returns indicate that the mills are few and small, and that the amount of their business is unimportant, and generally less in 1883 than in 1882. Several portable mills appear to be making wasteful havoc with what remains of the woodlands.

Sullivan County.—The establishments in this county are small, and their products quite diversified. Besides lumber, several turneries and stock for turning constitute their principal business. In one establishment 3,000 boxes clothes-pins were manufactured in 1883.

KINDS OF TIMBER SAWN.

Belknap County.—Pine mostly; spruce, hemlock, oak, ash, and birch are mentioned.

Carroll County—Pine, spruce, hemlock, and hard woods principally. In one instance poplar, and in one red oak is specified as the principal kind sawn.

Cheshire County.—Pine, hemlock, chestnut, beech, birch, ash, red oak. A considerable amount of second-growth or sapling pine is used.

Coos County.—Spruce timber is the main dependence. There is plenty of hemlock, birch, and maple, but none of the latter is sent away yet (*H. B. Colebrook*). Nine-tenths of the timber cut is spruce; the rest about equally divided between maple, bass, cedar, birch, hemlock, and ash (*A. O. Stewartstones*). For flooring, we cut about 30 per cent. of maple, 10 per cent. of birch, and 10 per cent. of beech. It is cut in lengths of from 12 to 18 feet (*J. M. W. Lancaster*). The soft-wood timber is disappearing very fast (*T. W. S. Colebrook*).

Grafton County.—The timbers mentioned in this county as used for lumber are pine, spruce, hemlock, beech, birch, maple, oak, and bass-wood.

Hillsborough County.—Sapling pine, chestnut, hemlock, beech, oak, maple, spruce, and various hard and soft woods are mentioned as the kinds used in manufacture. In two cases the amount of pine is mentioned as three-fourths; in one, hemlock is three-fourths, and in one it is equal to pine.

Merrimack County.—The kinds of timber used in this county are hemlock, pine, chestnut, oak, birch, maple, spruce, beech, poplar, and bass-wood. The amount of small sapling pine made into staves is very great as compared with the timber resources of the county.

Rockingham County.—From one-half to three-fourths of the lumber sawn in this county is white pine, and mostly sapling trees of very small size. It will be seen under the head of miscellaneous remarks that one return speaks of logs that will saw but 10 feet board measure. The kind next after the pine most used is hemlock; and after this, chestnut, oak, ash, elm, and bass-wood.

Strafford County.—Much the largest portion is white pine. In several instances it is specified as of second growth. Next, after this, hemlock in the proportion of one-fifth as compared with pine. Oak, ash, beech, birch, and maple are mentioned in two or three of the returns.

Sullivan County.—Nearly every kind of timber growing wild in the State is mentioned as in use for lumber in this county. The principal kind appears to be pine; in some cases hemlock, and in others the hard woods.

REMARKS CONCERNING THE SIZES OF TIMBER EMPLOYED.

Belknap County.—Timber has been very much reduced in size within 10 miles of me within the last ten years. About 15 logs required for 1,000 feet (G. W. N., *Gilman*); other estimates fix the number at from 5 to 12.

Carroll County.—Estimates of 5, 9, and 12 logs to 1,000 feet. In one case 5 trees. In one return logs are mentioned that would only saw 3 by 4 inches.

Cheshire County.—About 5 logs of the stock of 1882–'83, and not less than 10 of the stock we shall cut in 1883–'84 (R. L. Co., *Keene*); in one return 10 logs of hemlock or 15 of spruce; in one, 15 to 20 logs; in one, 12 to 15 logs; in three, 10 logs; in two, 13 logs; in one, 7, 8, or 9 logs; and in one, 8 to 10 logs.

Coos County.—In one case, 3 trees; in one 3½ to 4 trees; in one, 4 trees; in one, 5 trees of spruce, or somewhat less of hard woods; and in one, 5½ trees. Expressed in logs, one estimate gave 7; two gave 8; one gave 9, and one gave 10 for 1,000 feet, board measure.

Grafton County.—In three returns, 4 logs to 1,000 feet; in one, 5; in one, 6; in one, 7; in two, 8; in one, 6 to 9; in one, 10; in one, 10 to 12; in one, 12, and in two, 15. Expressed in trees, one returned 3 and one 5 to 1,000 feet of sawn lumber. In number of feet to a log one estimated that hardwoods would average 100 feet; peeled hemlock, 120 feet, and sprtuce 115 feet in square-edged boards, or 120 feet in dimension timber.

Hillsborough County.—In one return, 6 logs to 1,000 feet; in two, 7 logs; in one, 8 to 10 logs; in one, 8 to 12 logs; in nine cases, 10 logs; in six cases, 12 logs; in one, 14 logs; in five, 15 logs; in one, 10 to 20 logs; in four, 20 logs, and in one, 20 to 25 logs, for 1,000 feet of lumber.

Merrimack County.—In one return, 6 logs; in one, 8; in one, 8 to 10; in two, 10; in three, 12, and in one, 15. In one case 4 trees, and in one 3 trees, or 10 to 12 logs were required to make 1,000 feet of lumber.

Rockingham County.—In one return, 3 to 4 logs; in one, 4; in three, 6; in one, 7 to 10; in one, 8 to 10; in four, 10; in one, 11; in one, 12; in one, 14; in one, 15; in one, 10 to 15; in one, 16; in one, 17; in one, 18; in one, 15 to 20, and in two, 20 logs for 1,000 feet of lumber.

Strafford County.—In one return, 4½ logs; in one, 6; in one, 7; in three, 10, and in one, 12 logs for 1,000 feet of lumber.

Sullivan County.—In one return, 5 logs; in one, 5 to 6; in one, 6; in one, 5 to 7; in one, 8; in one, 8 to 10; in one, 10; in one, 12; in one, 15, and in one, 15 to 18 logs for 1,000 feet of lumber.

REMARKS CONCERNING FOREST FIRES.

Carroll County.—Forest fires have in quite a number of instances been set from pipes and matches in the hands of careless smokers (L. P., *Union*). There are few fires in this part of the county. The felt-wad used in gunning in this section prevents many fires which were formerly common (W. C. T., *Wolfborough*).

Cheshire County.—Most of the fires around here are set by hunters (T. F. B., *Chesterfield*). Carelessness in burning small brush-heaps, when the ground is dry, is a principal cause of fires (A. A. E., *East Sullivan*). The only forest fires that trouble in this section are those caught from the engines on the railroads (J. B. K., *Keene*). In the summer of 1883 about 100 acres of timber land burned over, and a great amount of valuable timber was exposed, but saved (*East Ridge*).

Coos County.—Fires have not troubled our section much, and were it not for running timber down the Connecticut River the growth would be more than the consumption in this county (H. B., *Colebrooke*). Most of the damage caused by fires is from the carelessness of hunters and fishermen. Some from the burning off of lands in clearing without giving seasonable notice, so that proper watchfulness may be had (G. W. B., *West Milan*). Forest fires generally come by burning off brush in the clearing of lands. Our saw-mill and several hundred acres of land were burnt in that way on the 1st of May last. Such fires are generally set by irresponsible persons. Where woodlands are burned a second growth quickly comes up, which will in time be as valuable as the first (J. R. & Sons, *Meadows*). The origin of forest fires in this section is chiefly from the carelessness of persons camping in the woods, a matter which it would be hard to prevent by law (A. O., *Stewartstown*). More fires are set by the carelessness of sportsmen than by any other persons. In fishing and hunting along the streams and around the ponds in the forests, they build fires and allow the fire to spread. By this means a large amount of valuable timber is destroyed (A. A. and R. W. H., *West Milan*).

Grafton County.—The fires in this region are mostly caused by the clearing of lands (E. S. C., *West Rumney*). Fires are often set by hunters, by smokers, by various accidents, and purposely, and it would be found hard to prevent them in districts where the timber has been cut (E. H. E., *Rumney*). Fires may generally be traced to care-

less hunters, or to sparks from locomotives (S. M. W., *Plymouth*). Our forests suffer more from incendiaries than from all other causes, and no care has heretofore been taken to prevent this (A. B., *Bristol*). Forest fires are mostly caused by fishermen (C. L. P., *North Woodstock*). Fires are most generally caused by fishermen, and in the clearing of lands. They are almost sure to get into the tree-tops when dry (C. D. T., *Littleton*). Forest fires are rare here; mostly caused by neglect in clearing lands, and from the burning of gun-wads (L. C. K., *Groton*). Most of the forest fires occur where timber has been cut, and it appears difficult to prevent it excepting by stopping the cutting of the timber (W. H. V., *Bristol*).

Hillsborough.—We have had no destructive fires in this region within the last forty years or more, with perhaps one exception. There is need of some check upon the wholesale slaughter of our forests (J. T., *North Weare*). Fires have destroyed some wood and timber in this section, but the ax is taking down our best wood-lots, and soon our old forests will be gone (J. N., *Hancock*). Forest fires in this vicinity have not prevailed to any extent. The forests grow rapidly, and a large amount of lumber is consumed (D. C., *New Boston*). Forest fires are mostly caused by hunters in dry seasons like that of 1883 (D. & G., *Milford*). The origin of fires has in some cases been from railroad locomotives; in others from neglect in cases where fires have been set to clear lands after the timber has been removed, and sometimes they are set by hunters to drive game. Forest fires seldom occur in this vicinity (J. H. E., *Greenville;* C. F. H., *Antrim;* D. F. B., *North Lyndeborough*). The origin of fires is generally from railroads, and from hunting in times of drought (W. A. H., *Antrim;* G. B. N., *Amherst*). There has not been much damage done in this region from forest fires; those that have happened were set, and lost control of (R. H. V., *New Boston*). Fires are generally caused by the carelessness of hunters, and by railroad engines (C. E. T., *Peterborough*).

Merrimack County.—Fires are mostly caused by carelessness, as in the dropping of matches after lighting a pipe, &c. (J. I. T. B., *East Concord*). There have been no forest fires in town for the past twenty years (J. W. F., *South Newbury;* G. & Co., *Henniker;* N. A. P., *Scytheville*). Forest fires are not very extensive in this region. They originate generally from smoking or hunting. Perhaps they might be prevented by a law imposing a heavy fine, or imprisonment, or both (C. M. & A. W. R., *Fisherville*). We have very few forest fires. They generally originate from people gunning in the woods (I. H. B., *North Dunbarton*). Forest fires are chiefly caused by gunners in the fall, and by the railroads (H. H. C., *Hopkinton*). The fires in this region are generally caused by careless smokers and hunters; the best way to control them is to set back-fires (W. T., *Bradford*).

Rockingham County.—A large proportion of forest fires is caused by sportsmen and smokers. They can only be prevented by more stringent laws against their trespassing in the forests, and a rigid enforcement of the laws (E. G. B., *East Northwood*). Forest fires are not very common in this vicinity, but occasionally there is one caused by sparks from locomotives (J. D. B., *Raymond;* W. L. D., *Hampton;* N. B. M., *North Hampton*. We are not often visited by extensive forest fires. They are generally the result of carelessness in burning brush in a dry time (J. T. B., *Hampton*). We are not much troubled with fires, and the few that we have are mostly set by railroad locomotives and by smokers or gunners. Some have been set by persons for the purpose of getting a job to cut the lot (W. P. R., *North Londonderry*). Most forest fires originate from hunters; some from portable saw-mills (C. A. M., *Epping*). Forest fires are, in the main, the result of carelessness on the part of gunners and smokers; frequently they are set by railroad engines (R. L. P., *Kingston*). We think that forest fires are on the increase, and that they are generally the result of carelessness. There should be more effectual laws in regard to the setting of fires in the dry season (G. R., *Deerfield Centre*).

Strafford.—Forest fires mostly originate from the careless burning off of newly cleared lands, and from fishermen and hunters (R. A. B., *North Strafford*). Fires in this region are mostly set by railroads (L. H., *Milton*). Our fires are mostly set by hunters (W. W. H., *Farrington*). Forest fires are, as a rule, caused by gunning, and the use of paper or tow wads (I. C. S., *East Rochester*).

Sullivan County.—Forest fires, I think, are caused partly by carelessness of hunters and partly by wantonness or rascality of transient persons (J. T. C., *West Springfield*). Forest fires are of rare occurrence in this vicinity. They are generally caused from the burning of brush by farmers, when they get beyond control and run through the forest somewhat (G. P., *Newport*).

MISCELLANEOUS REMARKS.

Carroll County.—On small wood-lots I think it advisable to cut old and decayed trees, and, where very thick, to trim up and keep the land clear of underbrush. The trees will grow faster, and the danger from fire will be less (L. P., *Union*).

The forests in this region are healthy, and I would say improving. There is more

wood and timber here than forty years ago, when they slashed and cleared land for cultivation (W. C. T., *Wolfborough*).

Cheshire County.—All good wood-lots are being rapidly cut away in this locality. At the same time a great deal of worthless land is growing up to wood, and will be available in from ten to fifteen years (O. D. B., *Munsonville*).

Our timber is mostly second growth and thrifty. A few trees only are found so old that they are passing to decay (T. F. B., *Chesterfield*).

We are cutting off the timber much faster than it grows, excepting firewood. It is the custom to cut clean, and then to allow it to grow up again. Timber lots are getting scarce in this part of the State (A. A. E., *East Sullivan*).

The timber is being cut off much faster than it grows (W. W. F., *West Chesterfield*).

The principal injury to our forests arises from the cutting of hemlock for the bark, which makes it necessary to cut the other timber to save it from being blown down by winds (E. B. G., *Marlow*).

The borers are working in the red-oak badly, and the top logs have a great many holes in them (E. J. G., *Parkhill*).

White pine and chestnut grow rapidly, and might be raised in this region with great advantage; but other varieties of trees grow more slowly, and it would be more difficult to keep up the supply (J. B. A., *Keene*).

Coos County.—We generally do not cut our timber smaller than 10 inches, unless the stumpage is bought, and then it is cut close. Large quantities of spruce are floated down the Connecticut. Clapboards can be freighted to the railroad and be made to pay, but not other kinds (H. B., *Colebrook*).

The general rule for cutting logs in this locality is nothing less than 8 inches at 20 feet from the butt, although some cut timber of less size. There have been no injuries to wood from insects in this section to any extent (G. W. B., *West Milan*).

It is sometimes inserted in the contract that trees shall not be cut less than 10 inches on the stump at 2 feet from the ground. Persons cutting on their own land generally cut clean. A considerable part of the very large trees in our forests are dying off, probably from age(J. R. & Sons, *Meadows*).

There is no limit to the size of trees cut, and many persons cut them so small that they are of little or no value (A. O., *Stewartstown*).

Timber is not generally cut less than 1 foot in diameter. No injuries have been noticed from insects (L. T. H., *Hazen's Mill*).

With young trees, the usual limit of cutting is 8 inches at the top end at from 16 to 20 feet from the butt. Old-growth spruce, or large trees, are usually cut up in the branches to where the balance is worthless. There is a large amount of small spruce and pines being cut and manufactured into shingles, staves, &c., that really don't pay anything on the stump, which, if left to grow a few years, would be valuable for saw-logs (A. A. & R. W. H., *West Milan*).

In a business amounting to 400,000 feet a year of maple, birch, and beach floor-boards (when finished for market), about 75,000 feet of square bobbin-stock is saved from the waste of slabs and edgings. To preserve our forests in productive condition nothing less than 12 inches at the stump should be cut, and the smaller trees allowed to grow (J. M. W., *Lancaster*).

In clearing lands we take nothing less than 6 inches in thickness at the top end. In clearing lands much timber is burnt on the ground, which, if there were railroad facilities, would be valuable in market (J. W. S., *Colebrook*).

Grafton County.—Our forests cannot endure for many years the present drain upon them. All sizes of trees are cut down to 4 or 5 inches, and the smaller sawn into shingles and lath. There are many places in this vicinity that were formerly good farms, but now abandoned, and growing up to bushes and timber, seldom or never of the same kind that formerly grew on the same land. Much of this new growth is of white birch and poplar, on lands once covered with pine (E. B., *Orfordville*).

A large worm or caterpillar went through the maple orchards the last of August, and stripped the foliage from the trees entirely, so that they will be greatly injured (J. A. N., *Dorchester*).

Spruce is cut down to 4 inches in diameter for making ladders. For timber and boards it is cut down to 8 inches. There is an insect that destroys the spruce and hemlock more or less every year, but there are no data for estimating the amount (E. S. C., *West Rumney*).

No rule for limiting the size of timber is observed, each one suiting his own convenience. Both wood and timber are becoming scarce, although the use of coal as fuel will prevent any great rise in the price of wood for fuel for a long time to come (S. M. W., *Plymouth*).

A commission should be created in each State for the protection of the forests (A. B., *Bristol*).

We have not been troubled with insects in this region; but the forest is disappearing rapidly, and, at the present rate of cutting, ten years will about use up the timber in this State (A. R. M., *Rumney Depot*).

No rule for cutting is established; but we do not generally cut timber less than 12 inches at the butt, and 8 inches at the top end (L. C. P., *Lebanon*).

The hemlock is damaged by hedgehogs to quite an extent on our ledgy hills, but no other timber suffers injury excepting from fires (L. C. K., *Groton*).

Hillsborough County.—The returns from this county are more fully reported than in any other. The establishments were generally small.

Stave-stock is cut down to 3 inches in diameter at the top; other stuff to 6 inches. The pine grows faster than it is cut for market, it being sapling and used for cooper-stock. Of oak and chestnut there is not now more than half as much growing as thirty years ago in this vicinity (M. M. B., *New Ipswich*).

A log for the saw-mill should never be less than 7 inches at the top end (A. D. B., *Pelham*).

The red-oak in this region has been somewhat damaged by a worm cutting through it, but it is only in the old growth that much injury is done. If every one would plant forest trees, to take the place of what they cut, there would be ground for hope (J. T., *North Weare*).

The forests are being cut off too fast, and lumber is cut too small. The least diameter used is 4 inches (D. C., *New Boston*).

Pine is cut as small as 5 inches for staves (G. P. H., *East Pepperell*).

The number of acres growing up to wood and timber appears to be as great as fifty years ago. Insects (ants and borers), and dry weather for the past two seasons, have worked much damage in some spots, although the growth has generally been healthy (D. & G., *Milford*).

Forests should have the taxes reduced, so that this investment will be desirable. Logs for staves are cut as small as 3 inches at the butt, and for hoop-poles to 1 inch. We have noticed a red and black caterpillar destroying the leaves of oak trees to a considerable extent (D. W. & D. N. H., *Hollis*).

The primitive woodlands have been cut off, and there is a large amount of young forest coming on. Most of the timber cut has been for building and repairing farm buildings. No injuries have been noticed from insects or other causes. The amount of pine is about the same as twenty years ago, the growth supplying the place of that which is cut. What we have now is mostly fit for staves and headings (S. W. H., *Lyndeborough*).

With the coal supplies there is wood enough growing for all wants as to fuel; but the timber must run short, as few lots are allowed to grow to sufficient size for timber except pine, which grows fast, makes poor fuel, but is used small for timber. I have cut 40 M sapling pines, the purchaser agreeing to take all down to 4 inches in diameter (J. W. C., *Hancock*).

As a rule for the maintenance of woodlands: "Keep out all cattle, and never attempt to thin out" (E. R. D., *Hancock*).

Within the last ten or fifteen years the old growth of wood and timber has been turned to market, and has nearly disappeared; still there is a young growth of white pine which comes forward quite rapidly and keeps the acreage about the same, but not the value. Trees are cut down to 2 inches in diameter (J. H. E., *Greenville*).

Forest supplies are gradually growing less (G. & Co., *Antrim*).

About 10 inches is the least diameter allowable in cutting trees (J. G., *New Boston*).

Heavy timber is getting scarce in this vicinity, but there is a great deal of young growth. No injuries from insects have been observed (R. B. H., *Pelham*).

I think the small timber fit for firewood is growing about as fast as it is cut; but that fit for sawing is not. As a general rule everything is cut down. No injuries have been noticed among the timber from insects. There is a great disregard for the future in the cutting of timber while it is too small (C. F. H., *Antrim*).

Forest supplies will always remain about as they are in this section, because the land is fit for nothing else (W. A. H., *Antrim*).

It is impossible to prevent men from cutting their own timber of any size they please. Perhaps a premium might be offered for the best growth of trees to some given size. The sawing of staves is preventing the growth of large pine trees. The drought is hurting evergreens largely, and the cutting of the small growth on the hillsides and along the streams makes it still worse (J. B. N., *Amherst*).

There is no limit to the cutting, which is down to from 2 to 6 inches, mostly second-growth pine (P. P., *Massabesic*).

Some damage has been done to the woodlands from dry weather (W. J. P., *Amherst*).

There is no limit to the size of cuttings; soft pine is cut down to 3 and 4 inches for staves, and 500 or 600 cords are used in town yearly—72 feet to the cord. The old forests in this part of the State are rapidly disappearing before the portable steam-saw-

mills—indeed most of them may be said to be gone already. The young pine is bought for kit-mills, and chestnut for telegraph poles and railway ties (R. H. V., *New Boston*).

The acreage of growing timber is larger in this town now than fifty years ago, and we think the annual growth is nearly equal to the yearly cutting. Pine is cut for cooperage down to four inches in diameter and upwards. The forests in this neighborhood have not suffered materially from any cause, excepting from the excessively dry weather that we have had for the last two seasons, which has had the tendency to lessen the growth, and in many cases to kill the trees (F. W., *Hollis*).

The old growth of timber in this town is nearly cut off. I think the number of acres of young growth is on the increase (D. N. B., *North Lyndeborough*).

Merrimack County.—The pastures are growing up to bushes, and they will soon form "wood-lots," but good building timber is becoming scarce from cutting and but little is taking its place. Spruce is cut down to 7 inches and white birch to 5 inches. Within the last three years there has been a general slaughter of nearly all the young and nicely growing pine lots in the town. About 2,000,000 feet have been carried off, where it would require a great many trees to make a thousand feet, as the trees would not average over 7 to 8 inches in diameter at 4 feet from the butt. It was as wicked as to cut up corn for fodder early in June (J. W. F., *South Newbury*).

The forest supplies near here are diminishing very rapidly. There is no limit observed in cutting; in fact, pine in particular is cut down to 3 inches in diameter for staves (G. & Co., *Henniker*).

In our section there are few hemlocks, because the hedgehogs destroy the trees while they are small (A. J. K., *New London*).

The forests should be allowed to grow to maturity, like any other crop—say to forty or fifty years. Above that age they would not be profitable as an investment (S. L. L., *Chandlerville*).

We have a considerable amount of old, worn-out land, as well as sprout-land, that is permitted to grow up again. I do not buy timber less than 8 inches through, but my customers bring logs for their own use down to 4 inches in diameter. I notice that there is a worm cutting off the leaves of the maples this year, but do not know what effect it will have upon them.

It seems as though everybody was crazy to get their wood and timber lots cut down, and there are men who make it their business in the winter to buy wood-lots and cut and destroy them (N. A. P., *Scytheville*).

It is suggested that the owners of woodlands should be encouraged to hold them by partially or wholly exempting them from taxation, especially the younger growth. There is no limit whatever to the size of the timber cut; if too small for lumber, it is used for kits and pails. A great many logs, and very small ones, are cut and forced upon the market in consequence of excessive taxation by the towns in which they grow, especially if the owners are non-resident. Such property ought to be taxed at a very low rate (C. M. & A. W. R., *Fisherville*).

Our forests are being rapidly diminished by the lumbermen, and our lands are feeling the effects of it badly. We have had two of the driest years I ever knew (J. H. B., *North Dunbarton*).

Spruce and hemlock among the mountains are destroyed by hedgehogs, which girdle the former, and nip off the buds of the latter; thus killing the trees. It would be good policy to plant acorns on all waste lands, and on others the pine (W. T., *Bradford*).

Rockingham County.—No injuries have been observed from insects or from other causes, excepting fires in this county (E. G. B., *East Northwood;* I. D. B., *Raymond*).

A motive for the preservation of forests would be presented if forest property could be exempted from taxation until nearly mature (I. N. B., *Fremont*).

Trees are cut as small as 4 or 5 inches. The portable steam-mills are making great waste of lumber (W. L. D., *Hampton*).

There is at present a larger acreage of woodland than forty years ago in this section (F. & E., *Candia*).

The portable steam saw-mills are the greatest enemies to the forests in this vicinity. There is no limit to the cutting, and many trees are cut as small as 5 or 6 inches in diameter (A. F. B. E., *Chester*).

Wood grows very fast in this section, and there appears to be a supply for years to come (I. T. B., *Hampton*).

Kit staves are cut 9 to 10½ inches long. A pile 8 feet long, 4 feet high, and the length of a stave, is called a cord; of which 364 were produced in 1883. For ordinary sawing timber is cut down to 6 inches at the butt, and for staves to from 1¼ to 2 inches. There are thousands of acres of waste lands in the county which should be restocked or seeded with forest by some process quicker than that which nature generally uses. If the Government would offer some inducement to agricultural communities to reserve or stock these lands for forests by offering a premium per acre, or by exempting from taxation for

a number of years, or both, I think that in a short space of time a great portion of these lands would be covered with a forest which in the future would greatly help to keep up our supplies (W. P. R., *North Londonderry*).

The common limit to cutting in this section is 6 inches at 1 foot from the ground. A worm is doing considerable damage in the hard-wood timber. It works like an apple-tree borer, and will girdle a maple tree so as to kill it in one summer. The timber on the whole appears to grow about as fast as it is taken off (A. J. T., *South Deerfield*).

There are no destructive agencies at work in our forests in this vicinity but the lumbermen, and they are getting it pretty well destroyed (J. W. T., *New London*).

I think the cutting off of our forests to such an extent is having a sad effect upon our country. I think it causes drouths, which for the last few years have affected New England terribly (N. B. M., *North Hampton*).

Pine lands when cleared grow up to other kinds; often to birch or maple. Pasture lands grow up to pine. There is no limit to cutting; logs are sawn as small as 4 inches. Some think that there is as much land covered with pine now as fifty years ago, but it is not of so good quality, being sapling instead of timber pine (C. A. M., *Epping*).

The portable saw-mills are overstocking the market, and thus reducing the price of lumber to a point where there is no profit, and at the same time reducing the supply. Anything is sawed that will make three boards 5 or 6 inches in breadth (D. P., *Plaistow*).

Timber in this section is generally sold by auction to the higest bidder, and is sawed down *to less than* 10 *feet to the log*. No damage has been observed to forest trees, except from the stripping down the bark of young and thrifty pines by children to get "sliver." The trees thus dealt with receive permanent injury (R. L. P., *Kingston*).

No limit is observed in cutting. We do not engage less than 6 inches in diameter (C. W. P., *Hampsted;* G. R., *Deerfield Centre*).

Timber is cut down to 4 inches. From 2,000 to 4,000 feet are sawed yearly for farmers, that is not over 4 inches in diameter (J. W. S., *Kingston*).

Strafford County.—We cut down to about 12 inches at the butt (R. A. B., *North Strafford*).

No rule is observed in cutting timber, except to take it clean. The portable mill is the greatest curse to our country, so far as our forests are concerned, for every lot of any value is bought up by speculators and cleared as soon as possible. Nearly one-third never reaches the market, but is felled and left to rot on the ground or spoiled and wasted by hasty work (P. P., *Strafford Blue Hills*).

The greatest injury to woodlands in this section of the country is from the ax and the portable saw-mill (S. R., *Durham*).

I think that a limit should be fixed upon the cutting of forest timber. If fixed at 10 inches, at the height of 16 feet, it would have a good effect (J. C. S., *East Rochester*).

The size of cutting is optional. Sometimes it is 6 inches (J. B. A., *North Strafford*).

Sullivan County.—We think that the growth of wood and timber in this section more than balances the amount cut (W. & B., *Charlestown*).

Our old-growth woodland is nearly all cut over, and the young growth is not so valuable as the old. No rule is known as to size; 5 or 6 inches is as small as I use. In a very few years all the old wood will disappear from this section of the county, and the second growth will be pine and hard woods (J. F. C., *Claremont*).

Large trees of old growth are fast disappearing, and we use small and inferior lumber in consequence. No reservations are made in cutting. The most noticeable feature is the indiscriminate cutting of whatever will sell, either for lumber or fuel, leaving the tops and boughs scattered over the ground among what saplings remain standing. As this brush soon dries, it is a good starting place for destructive fires (J. T. C., *West Springfield*).

Lumber and wood are going off fast in this section. Some let the land grow to wood again; all ought to (J. L. G., *Sunapee*).

There is too much cutting and slashing of forests in the greed of gain. There is no limit to the cutting, and logs no more than 6 inches in diameter are brought to mill. It is my opinion that we could produce as many feet of lumber and save our forests fully one-third if people would husband their woodlands; but it is too often the case that parties will clear a piece of land and then sell it for what it will fetch. Many times parties living at a distance purchase whole farms and make clean work of the wood and timber, not caring for anything but the immediate cash they can get (G. P., *Newport*).

The hedgehog is the worst pest we have in our woodlands. We cut our wood-lots clean (C. P., *Lempster*).

Wood is cut down to 6 inches in diameter, but it is not profitable to a wood-grower to cut timber under 12 inches (G. H. S., *Claremont*).

WEST VIRGINIA.

The Hon. B. L. Butcher, of Wheeling, State superintendent of free schools, to whom we are especially indebted for an extended list of names, makes the following general statements concerning the forests of West Virginia:

To include the whole State I should say there is not more than one-third of it cleared of its timber. I could give some smaller areas much more accurately, but shall now only mention the above estimate.

The clearing has been largely for agricultural purposes. Within the past ten or twenty years, however, large bodies of timber have been cut for lumber. The traffic is increasing enormously. The growing forests will but very inadequately supply the vast reduction of our forest area. What growing forests we have are spontaneous, and only permitted to grow because the soil on which they stand is poor and not in demand for grazing and farming purposes.

It is very hard to estimate the amount of young wood growing in this State. I doubt if there is any young wood growing that the owner expects to utilize for timber. In a number of localities, where the good timber has been culled, the young wood is permitted to grow, because the owner has no further use for the land than to strip it of the valuable timber. I cannot give an estimate for the whole State in acres. I perhaps could give estimates of some counties under this head.

There has been no effort whatever in this State toward the cultivation of forest trees for commercial purposes. All the hard woods known to the temperate zone are well adapted to our State, some in one locality, and some in another, depending upon the elevation, soil, &c.

A vast amount of damage has been done by forest fires. I should be at a loss to estimate the extent. Sometimes a whole mountain is utterly destroyed by a single fire. The cause of these fires is generally carelessness—sometimes malice. We have legal penalties for willfully setting fire to the woods.

In reference to the duty of the General Government for the preservation and increase of forests on the public domain, I should advise stringent laws for the protection of what timber is already on these lands, and perhaps provide for the planting of some kinds of valuable trees on such of these lands as are barren.

REPLIES FROM CORRESPONDENTS.

Boone County (Hon. Joel E. Stollings, Boone C. H.).—It is estimated that at least 80 per cent. of the land in Boone County is in forest and heavily timbered, consisting of yellow and white poplar, white oak, black oak, red oak, chestnut oak, maple, hickory, locust, white and black walnut, cherry, birch, beech, linn, chestnut, cucumber, holly, dogwood, elm, sycamore, black pine, gum, and hemlock. The poplar and oak are in the greatest abundance, the poplar growing to the height of 125 feet without a branch or knot. It is nothing unusual to find poplars 60 inches in diameter; but the average height is 75 to 100 feet, and 30 to 36 inches in diameter. This timber is abundant, and but little, comparatively speaking, has been removed from the forest. The white oak is also very abundant, and grows to a large size.

The territory of Boone County is mountainous, the western portion being drained by the Little Coal River and its waters, the eastern portion by Big Coal River and its waters. The county has an area of about 600 square miles, or 384,000 acres, of which about 76,000 have been cleared and brought under cultivation.

The estimate of marketable poplar is about five trees to the acre, or 1,540,000 in the county, worth $2 per tree in the forest, aggregating $3,080,000. The estimate of marketable white oak is eight trees to the acre, worth $1.50 per tree, or $3,698,000. Other woods are valuable in proportion. The estimate of all kinds of wood, per acre, is about 200 cords.

The forests have been cleared almost entirely to gain land for agricultural purposes, and the wood piled and burned, or otherwise destroyed, all along the valley of the Big and Little Coal Rivers. At an early day, in clearing up the lands, the poplar and walnut with which the lands were covered were considered of no value. The growing forest to some extent will supply that destroyed, more in the poplar and other woods than the walnut. About 75 per cent. of the forest is composed of old, or full-grown, timber.

Braxton and Clay Counties (Hon. Felix J. Baxter, Braxton C. H.).—I am familiar with the area of the county of Braxton and the adjoining county of Clay, both of which lie on

the Elk River, and both are covered with timber, except about one-eighth of the territory, which is cleared for agricultural purposes, and a small portion cut for lumber. The quality of timber in these counties is good. It is generally large, sound, free from knots or other defects, and consists of white oak, poplar, chestnut, white and black walnut, beech, birch, hemlock, hickory, linn, pine, maple, locust, cherry, and other woods, the most plentiful and valuable being the two kinds first mentioned. The entire area of these counties was densely covered with timber before it was improved. The timber has been removed only for the purpose of preparing the land for cultivation; a comparatively small portion has been taken for lumber. There is no young wood growing in these counties, except that which springs up in the forest, to take the place of the timber that dies and falls down. There are but few waste improvements growing up, and no territory is denuded of timber by fire or storms, and none bare from natural causes. Under these circumstances there are no benefits to be derived from planting forest trees here, and no person has engaged in it; we have too much timber now. The injury from forest fires has been little; in fact but very little to the valuable timber. Many trees when cut show an age of three hundred or four hundred years, and are perfectly sound.

Brooke and other counties (*Hon. J. B. Sommerville, Wellsburg*).—About 80 per cent. in the "panhandle" counties—Hancock, Brooke, Ohio, and Marshall—has the native timber remaining, chiefly oak, hickory, sugar maple, walnut, &c. It is of medium quality. Originally the district was all timbered. The timber has been cut for lumber, fuel, and for clearing the ground. The growing forests will not supply any considerable portion of the timber cut. It is estimated that about 10 per cent. of the woodland consists of young wood growing naturally.

Almost any timber tree will flourish in this district. The advantage of planting would be very considerable, but no one is planting to any extent. There has been no material injury from fires.

The matter of forest-protection and increase should receive the earnest attention of the General Government, but no plans are suggested.

Cabell and other counties (*Judge H. J. Samuels, Barbourville*).—In the counties of Cabell, Wayne, Logan, Wyoming, McDowell, Mercer, Raleigh, Fayette, Boone, Putnam, Kanawha, Lincoln, and Summers, I think that one-half of the land is in farms; the residue is in the original forests, from which some lumber has been taken. Large amounts of good lumber, locust, chestnut, black, white, red, and chestnut oak, ash, walnut, beech, pine, cedar, and sugar and other maples are here, but the destruction of timber is increasing in geometrical progression annually.

The timber has been cut for lumber, fuel, and agricultural purposes, and for the latter vast numbers of trees have been, and are yet in some localities, burned in clearing land for farms. The waste cannot be supplied so long as the present methods are permitted; and experience, the great teacher, will call a halt when too late to remedy. More than half of the land in the counties above mentioned has young wood growing naturally; all the farms have some young trees in them, and it takes much labor to keep the wood down on cleared land. Abandoned land grows up in thickets of small trees, which would become forests of good timber trees in a few years, the more vigorous living and crowding out the weaker. I have witnessed it frequently in this region; the law of "survival of the fittest" is true of trees in an eminent degree.

There is no necessity of planting trees in this region. Turn out the land, and trees cover it spontaneously. An old field will grow up in yellow pine. Clean off the pine, and the land grows up in black and red oak. What is the explanation? What vital principle generates pine exclusively in land cultivated for fifty years and which had hundred-year-old trees on it when first cleared?

The forests have not been injured to much extent from fires. Hoop-pole timber has been killed for a year or two, but a new growth springs up rapidly from the roots. Fires are caused by hunters; by malice, to annoy an enemy; by mischievous boys; by locomotives; by lightning; and by shot-guns using tow and paper wads. In this region, by raking away the dead leaves around a fire, they are able to control and stop it.

For the protection of the public forests, employ armed keepers with good salaries, empowered to shoot timber thieves, and dock the salary for every tree lost, killed, or destroyed in any unlawful way within the district in charge.

From counting the growths of numbers of trees I find white oak, ash, pines, and hard woods generally best from sixty to eighty years old; locust about thirty. After these ages the wood becomes more porous, brittle, and subject to the borers or worms. Our barren or poor hills will some day become covered with the black locust, a most valuable timber to resist decay, in or out of ground. The same applies to red cedar.

In addition to the crude answers above given, I would state that West Virginia has to-day more timber trees than all the States north of Mason and Dixon's line, from Maine to the Mississippi River, with the solitary exception of the white pine, and that is disappearing by rapid marches. The railroad is a monster that devours the forests

remorselessly and mischievously. At least a hundred thousand white oak trees are cut down on the line of the Chesapeake and Ohio Railroad annually for staves, and three-fourths of the tree—and often nine-tenths—are left to rot, the residue being sent to all the world in staves. Vast tracts of rugged hills are now clothed with splendid trees. The land could be bought at from 25 cents to $5 per acre. Narrow-gauge roads are creeping off from the main lines to devastate whole regions; but if rest were given West Virginia she would reclothe herself in a few years. The clearing of the lands and the plowing of our hills are most pernicious practices. Almost the whole of the State should be pastoral, and woodland pastures can be made of all the territory.

If there is power in the Federal Government to protect the timber it ought to exercise it. Indeed I fear, if there is not some power exercised to arrest the destruction of the trees and to stop the hill-side plowing, rains will cease and the denuded rocks present the appearance of the ragged ridges one encounters on the road from Jaffa to Jerusalem. I have witnessed a fishing-stream, where I caught fish (when a boy), disappear, and is now only a gully to carry off the water of a thunder-shower. I would do anything to save our woods, but ignorance seems to control the masses of our people. The bad economy of making a dollar for ourselves, and letting posterity take care of itself, is changing our climate and making drouths of common annual occurrence.

Large tracts of land in Mississippi and Alabama and other States are yet clothed with original pine trees that the Federal Government has never patented. Let it be withdrawn from entry, to a large percentage, and sell the timber, as governments in Europe do on their national domains, in such quantities that the growth will equalize the amount taken from the land.

Greenbrier County (*Thomas H. Dennis, Lewisburg*).—In this county much of the native forest has been cut down, generally for agricultural purposes. The whole county was once covered with wood, and many varieties of timber are still left in large quantities. The early clearings were to obtain land for cultivation, but much is now cut for lumber. The business is becoming of some importance. It cannot be stated as to the extent to which the growing forests would supply the place of those that have been removed.

This county has about a thousand square miles of area. I should estimate that three-fourths, and perhaps a much larger proportion, is still in native forest. The county is mountainous, and these mountains are generally covered with timber of excellent kinds, such as oak, hickory, ash, maple, sugar maple, walnut, poplar, &c.

There appears to be at present no necessity for planting forests in this county, and none are engaged in the business. I do not think much injury has been done in this county by forest fires. A fire occasionally gets out in the mountains, but the destruction of fences seems to be the chief injury complained of.

Hancock County (*Hon. John R. Donehoo, Fairview*).—This county has been cleared of its native forests to the extent of about 90 per cent. The timber left standing is mostly black, red, and chestnut oaks, hickory, walnut, poplar, and chestnut. The same answer would pretty accurately serve for the entire "panhandle" region. The clearing has mostly been done to gain land for agricultural and grazing purposes. Much, however, has been used for home consumption, in the building of houses, fences, &c. The growing forests will not nearly supply the place of those removed, and henceforth barely meet the ordinary demand for buildings, &c.

We have in this county, practically, no young wood growing naturally, excepting the ordinary proportion of young trees among the old of the remaining forests. There has been no planting of forest trees whatever. The necessity for this does not yet exist; nor is it likely to occur so long as the planting of orchards and fruit trees, and the use of the soil for agricultural and grazing purposes, is so much more profitable. Fires have not damaged the forests in this county to any appreciable extent.

No suggestions are offered in reference to the management of woodlands upon the public domain, &c.

Hancock County (*L. R. Smith, New Cumberland*).—The woodlands have probably been cleared, within the region under observation, of two-thirds of their timber. The kinds left standing are chiefly oak, pine, and hemlock. This would apply to Hancock, Brooke, and Ohio counties, all of which were formerly covered with timber of excellent quality. The present supply is estimated at a third of the former amount, and of the young growing timber one-twentieth. There has been no planting. The kind likely to thrive best would be oak. The proper measures to recommend are the prevention of wanton destruction and the planting of kinds suitable to the conditions.

Harrison and other counties (*D. C. Louchery, M. D., New Salem*).—In Harrison, Doddridge, and Taylor counties, West Virginia, two-thirds of the forests have been cleared. White oak, chestnut oak, red oak, and hickory form the principal kinds that are left, with some maple, gum, tulip, poplar, and white pine of good quality, excepting where it has been culled. The lands have been generally cleared for agricultural and grazing purposes, but of late years for lumbering, followed by grazing. The growth would sup-

ply the needs of the counties, but none should be wasted. About 20 per cent. of the woodlands are of young, growing timber. Only a small part of the lands cleared have been allowed to grow up again, and there has been no planting. Oak, hickory, and walnut might be grown abundantly, if cultivated. The forests have not suffered much from fires, which generally are caused by clearings in the spring.

The preservation and renewal of woodlands upon the public domain should be encouraged by all worthy means, and especially by promoting education in methods of planting.

Harrison and other counties (*Col. John R. Boggess, Clarksburg*).—The counties of Harrison, Marion, Doddridge, Ritchie, Calhoun, Gilmer, Braxton, Webster, Randolph, Tucker, Upshur, Barbour, and Taylor have been cleared to from one-tenth to three-fifths. Randolph, Tucker, and Webster, and their adjoining counties, now have our finest timber. White oak, poplar, ash, black walnut, cherry, and pine are most abundant, and of very good quality. These counties were originally all covered with forests.

Most of the clearing has been made for agricultural purposes. Along the navigable streams the poplar and white oak timber has been marketed for lumber for the last twenty years. From four to five miles away from these streams it has been burned. We have no growth to take the place of the timber destroyed. Black walnut and locust might be grown profitably.

In about one-tenth of the forests cut of valuable timber, there is a considerable amount of undergrowth, which so far has not been esteemed of value.

There has been no planting, except for ornament and shade. In some localities, valuable timber has been destroyed by fires, which usually get out from clearings or hunters' camps, but no serious damage has occurred. The trees of most value (walnut, poplar, oak, &c.) come to their greatest value in from one to two hundred years. Walnut, cherry, and oak might, perhaps, be used for furniture in from twenty-five to fifty years.

All the most valuable forest trees in a great portion of West Virginia have been cut and burned to prepare the land for cultivation and grazing. We still have, however, large forests of fine timber in the counties of Randolph, Tucker, Webster, Braxton, and Clay, and on the tributaries of Great Kanawha. Harrison County has an area of about 280,000 acres, and of this 200,000 is improved land. Lewis, Upshur, Barbour, Taylor, Marion, and Doddridge counties, have about one-half improved. There are still large tracts of timber on the headwaters and tributaries of the Little Kanawha, Elk, and Gauley rivers, West Fork of the Monongahela, Buckhannon, Middle Fork, Tygert's Valley, and Cheat rivers. The best kinds are oak and poplar, and there is fine cherry, ash, hickory, sugar maple, beech, and chestnut. In the mountains there are large tracts of pine.

Harrison County (*Prof. Jay F. Ogden, Bridgeport*).—It is estimated that in Harrison County, West Virginia, about 60 per cent. of the timber has been cleared, and that of the remaining 40 per cent. at least a fifth part lies in the northwestern part of the county. We have oak, poplar, walnut, hickory, chestnut, maple, sugar, ash, locust, &c. Along the West Fork River and the Baltimore and Ohio Railroad the largest and best timber has been sold for ship purposes. Back from the river and the railroad the best timber has been sawed into lumber and used for local building purposes; but some very valuable timber has been removed and burned to obtain land for agricultural purposes.

There is but little young growth here, it being cut back by the farmers who desire the use of their land for grazing purposes and grain.

In reference to the possibilities and advantages of forest-tree planting, it is possible that it could be engaged in with advantage and profit, but it is not probable that our farmers will do so for a great many years yet. The locust and poplar are the best adapted for cultivation in this region. Fall planting seems to be preferred.

Of late years there have been no forest fires in this region injuring timber to any extent.

With reference to the action of the General Government, it is suggested that it would be judicious for the Government to purchase timbered lands, and by law preserve the timber upon them for future use. It should also, by wise legislation, encourage the planting and cultivation of trees.

The timber in this State is most highly prized when the trees are of mature age and development, but locust is sometimes cut while young for posts, using them singly and sometimes splitting in twain.

Jackson County (*Hon. J. J. Hassler, Jackson C. H.*).—It is estimated that 25 per cent. of the land in this county has been cleared. The timber left is principally white oak, poplar, pine, buckeye, maple, beech, and hickory. The quality is fair, and in many places fine. The whole county was once covered with forests. The clearing was made principally for agricultural purposes, but much has been used for lumber and like purposes. The growing forests are small second growth, and of a light per cent. There are no means for determining the amount of small growth. It is so slight as to be of no importance in making estimates. No planting has been done in this State, except for or-

namental purposes in towns, cities, &c. Forest fires are not frequent and seldom destructive. The loss from this cause is very slight. The time for cutting depends largely upon the kind of timber used and the condition of the trees. Generally it should be when the trees have matured, unless a second growth is required and the size is somewhat considered.

Jackson County (*Judge R. S. Brown, Ravenswood*).—From 50 to 75 per cent. in Jackson and adjoining counties have been cleared. The remaining timber consists chiefly of oak, hickory, and walnut, generally of good quality. The lands were cleared for agricultural purposes, fencing, and building. The supply is almost exhausted in some places. About 75 per cent. of the growing timber is young and thrifty.

No experience has been had in the way of planting, except for ornament. The elm for this purpose is a favorite tree. The forests have not been injured by fires to any great extent.

As to the preservation and increase of forests on the public domain, it is recommended that prolific trees, such as the maple and the elm, should be planted. It is difficult to estimate the age of trees. The oldest are the best, at least up to fifty or one hundred years.

Jefferson County (*Prof. D. D. Pendleton, Shepherdstown*).—The timber of this county has disappeared gradually but steadily, sometimes in large tracts, under an apparently growing conviction on the part of land-owners that at present rate of taxation and value of land per acre it does not pay to keep bodies of timber which yield nothing. This would apply to Jefferson and adjoining counties. The timber mainly cut is walnut, ash, hickory, and white and red oak. The same kinds are left, but generally of inferior quality. Frequently large areas are stripped of all good walnut and hickory and much of the white oak.

The clearing has been made mainly for lumber. The growing forests will by no means supply the loss. There is little or no transplanting, as there should be. Indeed, I believe it would be to the interest of the General Government to receive *certified proofs of trees planted by former and still living* residents in the long-settled portions of the country, at a reasonable per cent. of the annual tax to the General Government, especially such as the varieties named above.

Not one acre in three hundred of the present woodlands is in young, growing timber. The possibilities of forest-tree planting are ample, and the advantages universal; but few men will, without some decided inducement, such as is above suggested, undertake this work adequately for future generations. The kinds most proper for this region, besides those above mentioned, are slippery elm, maples, wild cherry, &c. The locust would perhaps prove the most valuable of all.

The best plan would generally be to plant the seed and cultivate for a year, as a crop of corn, and then transplant. In the case of walnut, hickory, &c., plant thickly where the trees are to grow permanently, and cultivate for a few years.

With reference to the preservation and increase of forests on the public domain, cease selling large areas to companies and sell to individual buyers for preservation. On the public domain, having no forests, sell to purchasers who will show, say, 5 per cent. of the area planted with trees and in thriving condition at the end of three years after purchase, the last payment being met by a certificate of the proper officer as to the fact.

Red oak deteriorates more rapidly than other kinds after a wood is once entered by the ax. In cutting out some timber, generally the best, the remaining trees are usually injured. Most red oaks will show from 80 to 120 rings of growth. The white oaks live longer and are not as subject to rot. Hickory generally shows from 50 to 75 rings. Locust at the age of 20 to 25 years, if closely planted, yields from 3 to 4 posts, the rest being rail timber; or, if sawed, more posts; or, say, 19 feet as lumber and the balance as posts.

Kanawha County (*Dr. John P. Hale, Charleston*).—The forests have been chiefly cleared for lumber for agricultural purposes to a very small extent. The possibilities of planting are very large, but no one has engaged in it. Timber in West Virginia is too abundant and cheap and returns are too slow to tempt any one to plant for profit.

The forests in this region have scarcely been injured by fires. What injury has been done is to the pine, but it is not much. The oak, poplar, beech, &c., are the prevailing kinds here. The Government should protect its forests and encourage planting in the sparsely-timbered States and Territories of the West.

Lewis County (*Matthew W. Harrison, Weston*).—In this county about three-fourths of the land is in cultivation, it having originally been in forest. The remaining timber consists of poplar, oak, hickory, and sugar maple, with occasionally ash, walnut, and beech. The best timber has been taken off. The forests were cleared for agricultural purposes, and there are none growing in place of those removed. The open lands are kept clear of bushes, consequently there is no young wood growing. There has been no planting done,

and no serious injuries have been suffered from forest fires. Inducements for planting should be offered.

Marion County (*Judge A. B. Fleming, Fairmont*).—I am acquainted in and with all the counties lying upon the Monongahela, West Fork of the Monongahela, and the Little Kanawha rivers. Upon the first two rivers about two-thirds and upon the last-named river about one-third is cleared, being farmed or grazed. All the land was originally well timbered. There is some walnut, ash, and linn timber scattered through the forest, but the most plentiful of the more valuable kinds consist of poplar and white oak. There is but little pine on these rivers. There is an abundance of sycamore, sugar maple, beech, maple, and less valuable kinds.

The forests have generally been cleared for the purpose of converting the land into farms. That portion of the timber near the rivers and railroads, say within 10 miles, has been utilized by shipping or running to market so far as taken off. The abundance of coal in this State and on these streams renders wood of but little value for fuel. Timber is yet too plentiful for any person to think of planting forests or of supplying any want by natural growth. I think, however, the growing of forests will not amount to much, unless in the mountains, and there are no such mountains in the counties named.

Parties generally clear the lands from which the timber is taken. I suppose that one-fourth of the remaining forest lands in the counties or sections named has had the most valuable timber cut therefrom, but it remains uncleared, and where the younger growth is making some headway it will in time become more or less valuable.

Aside from shade, ornamental, and fruit trees, but few others are planted. I may except locust. Almost all farmers cultivate locusts for posts. Locust posts of a good quality put in the ground when seasoned will last twenty or thirty years. Such posts are valuable for wire, plank, and rough-and-ready fences.

Forest fires have done no injury in the region under notice. There is too much cleared land, and in this section no public precaution is necessary. As there are no public domains in this State, no attention has been given to forest preservation by the Government.

I am engaged somewhat in the timber and lumber business, and from my observation our oldest timber, especially poplar and white oak, has about obtained its growth, and much of it is beginning to decay at the top and heart and getting poorer. As a rule, white oak and poplar are not full grown and of their greatest value until at from one hundred to one hundred and fifty years old.

The above statements refer particularly to the counties of Monongalia, Preston, Taylor, Marion, Harrison, Barbour, Upshur, Lewis, Doddridge, Braxton, Ritchie, Gilmer, Calhoun, Wirt, and Wood.

Mason County (*W. J. Kenny, Point Pleasant*).—In this county the native forests are fast disappearing; especially is this true along the water courses. Timber is scarce for any purpose. What is left of the grand old forest is beyond the grasp of the market, and consists of walnut, poplar, oak, cherry, chestnut, and many other species of the best and most useful timber. Formerly, as has been the case with all of West Virginia, this was the home and hunting-ground of the red man and an unbroken wilderness, and the paths that led the early hunter and pioneer from the waters of the Great Kanawha to the advanced white settlements of the Alleghany Mountains were blazed and marked by these early explorers upon the old primitive trees that formerly abounded here and which have long since given way to the highest and most prosperous agricultural development.

While in most cases the forests have been cleared for settlement and agricultural purposes, a great deal of our timber has been cut for lumber and for exportation to other States. Thoughtless of the future in this, as in many other things, our people have been improvident and reckless in the destruction of their timber, and the best quality and rarest specimens have succumbed to the fire and ax of the first settlers that could have been spared to increase the wealth and add much to the beauty of miserably kept farms and unsightly plantations. From my personal acquaintance with Mason County I may safely say that the young wood allowed to grow in some cases will not contribute to supply what has been removed, and such young growth is allowed only temporarily. There is no disposition to foster the growth of forest trees; on the contrary, the tendency is to destroy what exists.

Forest fires occur only through accident, and then are controlled without much loss. The preservation of forests upon the public domain should be promoted by restrictive laws, and planting should be encouraged by granting inducements for planters therefor.

Monongalia County (*T. F. Watson, White Day*).—This report will be confined to Monongalia, Marion, Preston, and Taylor Counties, about one-half of which has been cleared. In sections where the land is fertile and level nine-tenths would have been cleared if the streams were large enough for floating the timber to market. In some other places a

large percentage is still in its native state. In the portions not cleared there are oak, chestnut, poplar, &c., of good quality.

A large portion of the land has been cleared to gain farming lands, fuel and lumber being only a secondary consideration. That lying near streams that would float it has been rafted to market. The growing forests would not supply one-quarter of what has been removed.

It is estimated that one-fourth part of the remaining timber is young and growing. Much of these woodlands is now gone over by cattle, so that the young growth is kept under and can not be depended upon, except that above the cattle's reach. Locust and chestnut grow spontaneously and are valuable for fencing. For this reason they are largely left standing. Apart from this we have no forestry, and, so far as can be seen, there will be no necessity for years to come.

But a small portion, perhaps one acre in a hundred, of the woodlands, and that in the mountains, has been damaged by fire, and the timber there is of inferior quality.

After maturity trees probably deteriorate at about 5 per cent. per annum for about ten years and after that more rapidly. The different kinds arrive at their greatest maturity at from sixty to one hundred and twenty years, and are then of their greatest value.

Morgan and Hampshire counties (*Hon. John J. Hetzel, Pawpaw*).—The timber has been taken away in the counties of Hampshire and Morgan within, say, 10 to 15 miles of the line of the Baltimore and Ohio Railroad, leaving little within this territory, possibly from an eighth to a quarter of the original growth, which once covered the whole surface. It is mostly of good quality. The timber has been cut for lumber, railroad purposes, bark for tanning, and fuel. Much of it has been rafted on the Potomac River to the east, and as much destroyed for agricultural purposes. Probably half of the former supply is growing again on the mountains.

In reference to the amount of young timber growing, there are no correct estimates to go by; but taking the entire area cleared, and comparing the growth of young trees, one-third would be the largest estimate that could be placed upon it.

There is no possibility or advantage to be gained by planting at present, and none has been done.

The forests have been injured to a small extent by fires, which are generally caused by locomotives, but sometimes by carelessness, and occasionally through mischief.

Nicholas County (*John D. Alderson, Nicholas C. H.*).—The answers to inquiries will be confined to Nicholas County, which has an area of 720 square miles, probably one-twelfth of which has been cleared. The whole was originally a forest, and in that which remains the kinds are chiefly oaks, pines, chestnut, poplar, beech, birch, sugar, walnut, cherry, and linn, generally of good quality.

The clearing has been made purely to gain land for agricultural purposes. The estimated area of forest is about 425,000 acres. There has been no planting, except for shade trees. Fires have done injury to a small extent. So long as trees are standing and growing age does not deteriorate their value.

Pocahontas and other counties (*Capt. W. L. McNeel, Academy*).—I am well acquainted with the country drained by the Greenbrier River and Gauley River, in the counties of Webster, Nicholas and Greenbrier, and I would say that nine-tenths of the original forest is still standing, consisting of white and red oak, chestnut, sugar-maple, cherry, hickory, poplar, white pine, and what we call "yew pine," and locust.

Of late the clearing has been mostly made for lumber. Considerable black walnut has already been taken, and large quantities of white pine and some white oak are now being cut. Much of the land has been cleared for agricultural purposes, and without using the wood. The standing forests are, of course, yet more than sufficient. There is no timber-planting in this section, but there is a large part of the county that ought to be bought and kept by the Government for timber alone. A tract reaching say from the Baltimore and Ohio Railroad to the Chesapeake and Ohio Railroad, 25 miles wide and 120 miles long, is now almost an original forest, and if kept and used for the purpose would be of great value. Planting is of no advantage to any individual owner at present rates.

Forest fires rage every year, but the timber does not seem to have been thus far injured to any serious extent, although the young growth is often killed.

The General Government should reserve and set out large tree plantations, as is done in Europe. It should secure now and keep the whole Cumberland range for that purpose. Chestnut and locust can be used to advantage at thirty years of age, or say three growths to a hundred years.

Putnam County (*Hon. John K. Thompson, Raymond City*).—In this county about 50 per cent. of the natural forests has been cleared. As the timber is taken off the land is used for agricultural purposes, and nothing is left standing. The whole county was formerly covered with wood. Formerly the timber was burned on the ground, but now all the valuable kinds are utilized, either for lumber, cooperage, or fuel. The growing forests

will supply the place of those removed only to a very limited extent. Only land that is unfit for cultivation is allowed to grow up again.

I doubt if there has ever been a forest tree planted in this county except for shade or ornamental purposes. Lumber is yet too abundant for our people even to have cast a thought toward providing for the future by planting.

We are very little troubled by forest fires. Such as we have are generally caused by carelessness in burning brush on land contiguous to the forests. When a fire starts the usual way of stopping it is to rake around and fire against it.

Raleigh and other counties (*General Alfred Berkley, sr., Raleigh C. H*).—In Raleigh, Fayette, Wyoming, Logan, and Mercer counties at least one-third of the forests has been cleared off. The timber left is white, red, water, and Spanish oak, linn, chestnut, dogwood, cherry, hickory, poplar, walnut, ash, some white pine, hemlock, spruce, and a very little yellow pine. A long time ago this yellow pine covered the whole of this region, but it has died out and been succeeded by the kinds above enumerated.

Since 1836, when the writer first became acquainted with these counties, the forests have chiefly been cleared for agricultural purposes. Recently black walnut, poplar, heavy oak, and chestnut-oak timber have been taken off the banks of New River and the two forks of Coal River for lumber, where access could be had to saw-mills and to streams for floating it away. About one-third of the woodlands should be young, growing wood. There would be no advantage in planting in this region so long as the native forests have not been largely encroached upon, but the day may come, half a century hence, when it will be necessary to replace those down, burned by forest fires, or sawed up and carried down the principal streams. In dry seasons the fires will sometimes do damage, but they are not so destructive here as in some other regions where there are large bodies of timber and few persons to extinguish them. As a means for providing future supplies those who settle upon the public lands should be required to plant out a certain number of trees per acre to replace those removed for agricultural purposes. All inroads upon the public lands should be punished by high penalties.

Ritchie County (*Dr. M. S. Hall, Ritchie C. H*).—Seven-eighths of the native forests have been cleared in Ritchie County; the remainder consists of white oak and chestnut-oak, with a little poplar. The entire county was formerly covered with woods. The clearings were begun for agricultural purposes, and afterward continued for the timber. Within the last twenty years it has been used as lumber, and sent to Baltimore, New York, and Europe.

It is not easy to estimate the amount of young wood growing naturally. There are no young forests growing up; but now they are beginning to save the little of the old that is left. The forests have never in this region been much injured by fire. The hunters used to fire them every fall, and being regularly burned there were never large and destructive fires.

The oak and poplar could no doubt, under favorable circumstances, grow for two or three hundred years in this region, as I judge by counting the rings of growth.

Roane County (*Hon. A. B. Wells, Spencer*).—One-half of the timber in this county has been marketed. The kinds left standing are hard oak, poplar, beech, and sugar-maple. There is scarcely any walnut left. The quality is generally good. The county was once heavily timbered. Until recently the clearings have been made to gain land for agricultural purposes. Half of the remaining timber is young and growing, but we have plenty of timber to supply home demand for a long time. There has been no planting. No injuries have occurred from forest fires. The General Government can do nothing in this State for the planting of forests, as we have no public domain in this State.

Taylor and other counties (*B. F. Martin, Grafton*).—In the counties of Taylor, Marion, Barbour, Monongalia, Preston, Randolph, and Tucker the grazing and arable lands are two-thirds cleared. Of the whole area of these counties not more than half is cleared, the other half being covered with timber, white oak, poplar, pine, sugar-maple, walnut, hickory, beech, &c.

The lands have been cleared chiefly for agricultural purposes. For the last few years immense quantities of lumber have been marketed. A large business is now doing in that line, and it is lessening the good timber rapidly. Young timber is growing on one-half of the territory of said counties, except where the lands are cleared. No forest trees have been planted in these counties. We have been destroying instead of planting. A few years ago the timber seemed inexhaustible, but since the lumber business has grown up the best timber is becoming scarce.

Fires have injured our forests somewhat, but not to a great extent. They occur mostly from the burning of brush and logs in clearings. Some occur from locomotives, but not often. No measures for State forestry management can be recommended. The State has no public domain.

Taylor and other counties (*H. S. Wilson, Grafton*).—The whole State was originally a forest and more than two-thirds is still woodland. The timber is oak, poplar, beech,

hickory, and maple. The clearings are estimated at one-half in Taylor and Barbour counties, three-quarters in Harrison, one-fifth in Preston, one-tenth in Tucker, one-quarter in Randolph, one-half in Upshur and Doddridge, and one-third in Ritchie. The above counties are partly in the First, Second, and Fourth Congressional districts of West Virginia.

The land has been cleared for agricultural purposes, and almost all the timber wasted. Latterly the clearings have been made for lumber. The forests are still of vast extent; no young wood is allowed to grow, as there is still too much timber. The woods do not suffer from fires.

Oak, the plentiest timber, ranges from fifty to seventy years (counting the rings and allowing one for each year's growth) before deterioration takes place, unless injured by falling timber. At the age of about one hundred years the roots begin to give way, and the storms then sift them out through the forest, making way for young timber. So it goes on from year to year, making no perceptible changes.

Tucker and other counties (*Dr. E. Harper, Saint George*).—In Tucker County the most valuable timber has been cut for sawing, and about one-tenth in Randolph. Barbour County has but little timber to spare for export. These counties were all formerly well timbered. The kinds left standing are white, chestnut, and Spanish oaks, chestnut, yellow pine, hemlock, locust, and yellow poplar. The quality of the poplar and yellow pine is the best; the chestnut and yellow pine are most marketable.

The clearings in Barbour County have been mostly made for agricultural purposes; in Tucker County, for lumber. The growing forests would supply about one-twentieth of the timber cut for lumber during the last twenty years. About one-tenth in area of the present woodlands is young, growing timber.

There are thousands of acres entirely destroyed by forest fires. They are principally caused in hunting deer by ring-firing. We have stringent laws against the firing of forests; and during the last ten years there has been a large amount of burning done. The best way to prevent fires is to get the public to understand that their timber is worth as much to them as their land.

Pine, of different kinds, appears to come to maturity at about one hundred years; poplar and cherry at from seventy-five to one hundred; ash at sixty; walnut at sixty; and locust at twenty. I know of districts where the timber was destroyed by storms, some fifty years ago, that at the present time furnish a plenty of good timber for all fencing and building purposes, and oaks of good quality for hewing, from 15 to 25 inches in diameter, can be now obtained. With poplar it is the same. I am sixty years old and remember seeing two black walnuts planted, one of which is now 30 inches in diameter, the other 24.

Tyler and other counties (*T. N. Parks, Middlebourne*).—I am personally acquainted with about two-thirds of the State. I know but little of the counties between the Great Kanawha and Kentucky. I suppose that one-half of this portion is cleared. Our land was formerly all timbered. Oak is most common. Poplar, pine, walnut, chestnut, hickory are also common, with beech, maple, and sycamore along the streams. There is some locust, cherry, and other kinds. The timber is very fine.

The land was until within a few years cleared almost entirely for agriculture. There was some timbering along the Ohio River and the Baltimore and Ohio Railroad before the late war; but since then it has become general over the State. A great deal of land is now being cleared for timber, and not used for agriculture. Many take off the good timber, and clear off the underbrush for agriculture also.

There has been little planting in the State, except of orchards and shade trees. The few locusts, sugar-maple, and walnuts planted do well.

No serious injury has occurred from fires, except in the mountain sections. There, on the mountain sides, large tracts are timbered, and fires often do great damage, especially to the pine forests. Fires are not common now in the more thickly-settled counties. Thirty to fifty years ago they were common, and the standing trees show some damage. A slight injury at the base of a small tree often causes it to be damaged or hollowed near the ground when it becomes large. Many of our finest trees are thus damaged near the base. No suggestions are offered as to the Government management of the public domain. Individuals act unwisely in many cases in cutting off the valuable timber and not clearing the land for agriculture. We have too much woodland in this State, but I think we have reached the point where it is unwise to cut timber and allow the land to lie idle. Where the large timber is cut away, our land grows up with a thick growth of underbrush that will not be valuable for many years. The proper age for cutting timber cannot be given. It is best when from 2 feet to 2½ feet in diameter. Chestnut becomes damaged from worms when old; other trees grow very old and large. Trees are usually tall, and if left standing on partially-cleared land they are apt to become damaged from cracks caused by the wind, known as "wind-shakes."

Upshur County (*Hon. A. M. Poundstone, Buckhannon*).—About one-half of the forest

trees of this county have been cleared off. A much larger proportion has been cleared in the northern part of the county than in the southern part. The timber left standing is principally poplar, white oak, chestnut, black walnut, and a small amount of wild cherry. The quality of our timber is good. The whole county was originally covered with forests.

Our forests until within, say, ten years past have been cleared simply to gain land for agricultural purposes. During the past ten years the lumber business has been carried on pretty largely in portions of our county. The growing forests will by no means supply the place of those removed. It is estimated that half of the remaining timber is of young growth.

Forest trees could be planted and grown with facility in this county, and would be an advantage in many localities, especially in the northern part, which is now largely denuded. Thus far no experiments have been made except as native forest trees (principally the sugar-maple) are grown as shade trees around houses and in towns and villages.

In many localities our woodlands have been injured by forest fires, which have almost always been caused by fires in clearings in the spring and autumn.

I think our General Government should adopt and carry out the policy of planting trees on the public domain. This should be done to aid in guarding against a timber famine, which will soon be upon us, and for the more important purpose of increasing the rainfall in many portions of the country. To the last inquiry of the circular a definite answer cannot be given. So far as my own observation extends our oldest forest trees seem to be as valuable for lumber as any other. I think the lumbermen will sustain me in this answer.

Upshur County, general statements (*Hon. George H. Moffett, Buckhannon*).—In West Virginia about one-half of the territory is still a native forest, a large per cent. being in the eastern section, which includes the mountain ranges. Along the Ohio River, and reaching into the interior, the valuable timber has been removed; but striking a line through the center of the State, commencing at the Maryland line, near Kingwood, in Preston County, and running southwesterly to the Big Sandy, and taking the territory east of that, the principal timber of value will be embraced, including poplar in great abundance, pine, hemlock, white spruce, or "yew," as locally named, and white pine similar to the Susquehanna pine. The latter is found only on the waters of the Greenbrier River. Walnut is not abundant, but of good quality. Cherry exists in plenty near the heads of the water-courses. Ash, linn, white oak, chestnut-oak, and red oak occur in some localities, and there is considerable of hickory.

The whole of West Virginia was originally covered with fine forests. The principal part of the timber that has been removed was taken off to gain land for agriculture, and consequently much of it has been destroyed. There is perhaps remaining in this State a greater quantity of valuable woods than in any of the Eastern States, but the bulk of it is as yet inaccessible, except as it can be floated out on some of the streams, which is being done on the Cheat, Greenbrier, and Little Kanawha rivers.

I have spoken of the entire State because I am familar with it all, and no particular section is designated.

Along the line of the Baltimore and Ohio Railroad considerable lumber is being shipped. In this section (on Buckhannon River) the lumber interest is increasing rapidly. About half the land from which the timber is cleared is in a condition for cultivation; the remainder is growing up with nice young groves of timber. Nothing has been done in the way of planting forest trees, except that the State superintendent of schools has "arbor day" for planting in the vicinity of public school-houses.

In the mountain region, along the main Alleghany range, considerable damage is done by fires every fall, by parties firing the woods for the purpose of hunting game. A strict law, well enforced, would probably stop it. There is no way to control these fires after they are started.

Chestnut comes to proper age for cutting at from thirty to fifty years; walnut at one hundred; poplar from fifty to one hundred; cherry from fifty to two hundred, and pine from fifty to one hundred years.

Wayne and other Counties (*H. K. Shumate, Wayne C. H.*).—This report applies to Wayne, Lincoln, Logan, and Wyoming Counties. A very limited extent of native forests has been cleared off. The most important timber standing is oak, but there is much fine poplar along the streams. The timber is of good quality. The entire country was originally timbered.

The clearing has been done for agricultural purposes principally, but a considerable amount of lumber along the streams has been marketed. The growing forests will supply it, but in a limited manner. Perhaps 75 per cent. of the area has young wood growing upon it naturally. No one has engaged in planting forest trees. The advantages are fair. Fires have injured the forests of late years to a limited extent. Formerly all small, young trees were mostly killed by fires.

Wetzel County (*Hon. Robert McEldowney, West Martinsville*).—This county was originally timbered over its entire extent with poplar, white and black oak, chestnut, chestnut-oak, sugar-maple, walnut, cherry, beech, hickory, ash, and woods of like character. The poplar is what is known elsewhere as the "tulip tree." About one-third of the county is entirely cleared—perhaps not quite so much. In Grant district, which includes more than one-third of the county, two-thirds of the timber is left, but it is being rapidly removed.

At first the timber was removed for agricultural purposes only, and one-quarter of the lands at least cleared. At a later period it has been cut for lumber and fuel, the poor woods, such as chestnut, oak, and hickory, being taken for fuel. Large forests remain, in the county, almost unbroken, chiefly of oak. The walnut and poplar are becoming scarce. The lands, when cleared, are being farmed, either for corn and wheat or as pasturage for cattle and sheep, no lands having been turned to the commons, so that there has been little new growth.

Young wood is growing on hill-slopes along the Ohio River that formerly were timbered, but not in many other parts of the county. This does not include an area of more than 10,000 acres. The soil in this county is very fertile, but the lay of the land is not favorable to agriculture, and a tract turned out would soon be covered by new growth. No planting has been done. I think walnut and oak flourish best, though perhaps the sugar-maple thrives equally well, if not better. The hickory does very well.

Forest fires are not frequent, and for many years the damage has been light.*

Wirt and other counties (*Prof. S. F. Wells, Wirt C. H.*).—This report will apply to that part of the State on the western border, namely, Wirt, Wood, Rowan, Mason, Jackson, Ritchie, and adjacent counties, in which I estimate that one-third part of the land has been cleared. The remaining forests consist of the soft and hard woods indigenous in the country. The choicest of this has been culled, yet much valuable timber remains. The first clearings were made to gain land for agricultural purposes. At present a very great percentage, amounting to enormous quantities, is taken for the timber; clearing the land for cultivation is an after-consideration. If the waste could be stopped, the planting of trees would be unnecessary. The damage from forest fires is considerable, but not so much, however, as in the northern pineries. The fires affect only the young trees and undergrowth. They originate mostly from clearings, but on account of the injury to fences such fires are becoming less frequent. Firms from Cincinnati, Boston, and Philadelphia have competed and are competing for our timber, and, unfortunately for our people, have obtained it at ruinous rates (considering its value) to the seller.

Wood County, &c. (*L. N. Tavenner, Parkersburg*).—Our whole adjacent country, when first wrested from the Indians, was a forest, namely, Wood, Pleasants, Ritchie, Wirt, and Tyler Counties. About half of the land has been cleared, the kinds left standing being hickory, sugar-maple, red, white, and black oaks, chestnut, pine, sycamore, ash, maple, elm, cedar, walnut, locust, and buckeye.

The forests were first cleared entirely for agricultural purposes. Of late years, while that has been the ultimate object, in many cases great numbers of trees have been felled simply for the lumber, principally for staves and heading for oil-barrels, and to burn for charcoal, or stripped for tanbark. Quite recently the soft woods have come into use for the manufacture of pulp, there being now at Parkersburg two large pulp factories. Much has also been used for railroad-ties. The growth of the remaining forests will not more than supply the place of that taken. About one-third of the trees too small for lumber are still growing. There has been no planting of forest trees. The soil is adapted to all kinds of trees hereinbefore mentioned.

Since 1870 no forest fires have occurred of serious importance. During the great rebellion, this being the border, both armies would frequently set fire to the forests in order to leave the trees bare of foliage, but no special damage was done by them. The fire was confined to a great extent to the dry leaves on the ground.

Black oaks are best at sixty to seventy years; red oaks, from seventy to eighty, and white oaks at one hundred and twenty-five to one hundred and seventy-five years. With others it depends upon the kind, and the soil and conditions.

ARBOR DAY IN WEST VIRGINIA.

With the design of interesting the youth in the public schools in the subject of forestry, the Hon. Bernard L. Butcher, State superintendent of free schools in West Virginia, upon the 27th of March, 1883, issued a

*Mr. S. W. Martin, of New Martinsville, W. Va., estimates that two-thirds of the land in Wetzel County had been cleared. The remaining kinds are mentioned as oak, poplar, walnut, beech, sugar, locust, and chestnut. The quality is good, and the present supply is estimated as sufficient for use.

circular addressed to teachers, school officers, parents, and pupils, recommending that the afternoon of April 27 of that year be devoted to the planting of shade and ornamental trees about the school-house lot of every free school in the State. In cases where no land was occupied for this purpose, he urged upon school boards the propriety of acquiring at least an acre of land, in rural districts, to be inclosed, planted, and kept "sacred to education."

As the success of this measure would mainly depend upon the interest taken by the teachers, he addressed his arguments chiefly to them, suggesting that they carefully explain to their scholars the object proposed, and secure their active co-operation, and also that of their parents and friends, who were invited to assemble at the appointed time, to assist in the proceedings. He suggested that some literary exercises be mingled with the ceremonies, and that the trees planted might be named in honor of some favorite person, and be placed under the care of certain particular scholars, who would take pride in their successful growth and future development. The children were to be encouraged, with the permission of their parents, to plant trees about their homes and along the roads bordering their parents' farms; and they were to be induced to make inquiries and obtain all the information possible about the names of trees, their value and uses, and whatever could be ascertained concerning them.

The April number of the West Virginia School Journal of that year contained several articles upon the subject of tree-planting, including much concerning the methods that should be followed in the transplanting of trees and the objects to be attained from judicious planting.

This movement was favorably noticed by the newspapers throughout the State, and from the information received from correspondents, it appears the suggestion was adopted in many school districts. The School Journal for May, 1883, contains numerous extracts from reports of proceedings, and friendly comments by the press, showing that this first public effort towards promoting an interest in forestry in that State, through the agency of the public schools, had produced an excellent result.

In a recent letter, the State superintendent of free schools estimates that 200 districts gave attention to the observance of "Arbor Day" in 1883, and remarks that the appointment was not made until after the schools in the rural districts had closed their winter sessions. He intended to renew the appointment for the succeeding spring, and by earlier preparation he confidently expected that at least 1,000 districts in the State would act upon the suggestion. The 18th of April was selected as the day, and the West Virginia School Journal for that month was largely devoted to this subject.

THE FOREST TREES OF WEST VIRGINIA.

In a volume describing the resources of West Virginia, prepared under the direction of a State Board of Centennial Managers, and published in 1876, an article appears, prepared by Prof. William M. Fontaine, upon the forest trees and medicinal plants of the State. From this we prepare the following list, with such occasional notes as appear proper, the arrangement being changed from the order as there given, and the generic names, as now applied by approved authorities, being placed in alphabetical order. We include only such as afford useful wood products, and omit shrubs and woody twining plants.

ABIES (*the Fir*).—The Southern fir (*Abies Fraseri*) grows upon the highest points of the Alleghanies, and is more abundant to the south, in Tennessee. It is generally inaccessible for lumbering purposes, and chiefly remarkable for the balsam that gathers in blisters under the bark. It occurs in Northern Pocahontas and in Pendleton and Eastern Randolph.

ACER (*the Maples*).—The sugar-maple (*Acer saccharinum*), often known by the single term "sugar," is one of the most valuable of the native trees, as well for its sugar as its wood. The census of 1870 returned 490,606 pounds of sugar and 20,209 gallons of maple molasses as made in that year. The ten counties having the largest yields, in the order of quantity, being Greenbrier, Pendleton, Pocahontas, Monroe, Randolph, Grant, Barbour, Monongalia, Mercer, and Hardy. It is remarked that the nothern wood, when dry, weighs 46 pounds to the cubic foot, is heavier than that grown south, and various uses are made of it in cabinet work, wagon-making, &c. The curled, bird's-eye, and other varieties highly ornamental in their grain are found. It is most common in the mountainous counties, and in some districts it constitutes half the timber.

The silver maple (*Acer dasycarpum*) in good situations grows to the height of 30 to 50 feet, with diameter of 2 to 4 feet, and occasionally much more. It prefers sandy loam and the banks of limpid rivers having a gravelly bed, and is rare in miry black soils. Its wood is white, but neither strong nor durable. It makes excellent charcoal, and the inner bark is sometimes used as a domestic dye for black, with copperas as a mordant.

The red maple (*Acer rubrum*) flourishes best in grounds subject to overflows, and in miry swamps; west of the Alleghanies it grows upon high grounds with oaks and walnuts, but not to so large a size as in the eastern swamps. It rarely occurs as a curled maple. The wood is soft and easily worked when fresh, but it is not strong or durable. It is principally used for the manufacture of chairs, saddle-trees, shoe-lasts, broom-handles, and other small articles. The curled variety is much prized for gun-stocks.

ÆSCULUS (*the Buckeyes*).—The fetid buckeye (*æsculus glabra*) is the most common species. It grows only near streams, and forms occasionally a large tree, but of no particular value. The sweet buckeye (*A. flava*) grows in rich woods and in mountains and knolly districts, often to the height of 50 to 60 feet, and 2 to 3 feet in diameter. Its wood is soft, light, and porous, not inclined to split or crack in drying, and for this reason it is used in making troughs, bread-trays, wooden bowls, shuttles, &c.

ASIMINA (*the Pawpaw*).—The common pawpaw (*Asimina triloba*) is very common in rich alluvial grounds, growing to the height of 10 to 20 feet, and bearing a pleasant, edible fruit.

BETULA (*the Birches*).—The black birch (*Betula lenta*) is rather a large tree along the Alleghany region, where it prefers moist, shady places. The wood is reddish, fine-grained, and used for cabinet work. The red birch (*Betula nigra*) prefers low river banks, and is abundant in some localities. Its wood is light colored, but not much used for lumber.

CARPINUS (*the Water Beech*).—The only species of this tree (*Carpinus Americana*) is not uncommon in moist, rich soils, growing sometimes to the height of 30 feet. Its wood is very hard, giving it in some sections the name of "iron-wood."

CARYA (*the Hickories*).—Four species of this genus are mentioned as abundant, viz: The scaly-bark hickory (*Carya alba*) grows to a large size, from 80 to 100 feet in height, and 2½ to 3 feet in diameter. The white-hickory (*C. tomentosa*) grows well on soils of medium quality, preferring dry woods and seldom becoming more than 18 inches in diameter. The wood is tough, hard, elastic, and of great weight. When small it is used for hoops, and when of larger size for carriage and wagon making, tool-handles, &c.; large quantities are also made into chairs. The wood is very liable to decay when exposed, and it is subject to the attack of borers.

The red hickory, or pig-nut (*C. porcina*), and the bitter-nut (*C. amara*) are common; the wood is less valuable than the species last mentioned, but is used for the same purposes. The hickories are all valuable for fuel, and are preferred for curing tobacco and bacon, not giving so strong a taste of creosote.

CELTIS (*The Hackberry*).—This tree (*C. occidentalis, var. crassifolia*) is common west of the Alleghanies, sometimes growing to the height of 80 feet with a diameter of 18 to 20 inches. It prefers cool, shady situations, and a deep, fertile soil, or along the borders of rivers. The wood is compact and fine-grained, but light and weak. It is sometimes peeled into strips and used in bottoming chairs and making baskets. It is easily split into rails, and sometimes used for fencing.

CERCIS (*The Redbud*).—This tree (*C. Canadensis*), though small, is quite common, often growing to the height of 20 feet, with a diameter of 12 inches. It prefers a deep, free, and sandy soil along the banks of streams. The wood is of great beauty when worked, being hard, finely veined, or blotched and waved, with black, green, and yellow spots, and when seasoned it takes a fine polish. The bark and young branches are employed for dyeing wool of a nankeen color. The flowers are used by French-Canadians in salads and pickles.

CORNUS (*the Dogwood*).—The flowering dogwood (*C. florida*) is found everywhere in the State, forming under favorable conditions a tree 30 to 35 feet high, with a trunk 9 to 10 inches thick, but is usually not more than half these dimensions. It thrives best in a gravelly soil, rich in vegetable matter and moisture. Its wood is hard, heavy, and fine-grained, and capable of taking a high polish. It is used for tool handles, hames of harnesses, runners of sleds, &c., and makes a very hot fire, leaving an abundant pure white ash. It is liable to split, and should be well seasoned before using. The inner bark has some of the properties of Peruvian bark, and it is sometimes used medicinally and for making ink. From the bark of the more fibrous roots the Indians get a scarlet dye. A dogwood 18 inches in diameter was reported from Braxton County.

CRATÆGUS (*the Haw*).—The scarlet-fruited haw (*C. coccinea*) is quite common in this State.

DIOSPYROS (*the Persimmon*).—The principal American species (*D. Virginiana*) grows to the height of 20 to 60 feet. It has a dark-colored wood, and botanically is closely related to the ebony of commerce.

FAGUS (*the Beech*).—The common beech (*F. ferruginea*) is quite common, growing to the diameter of 2 to 3 feet. Its wood is used for planes, shoe-lasts, tool-handles, &c., but it is mostly employed for fuel.

FRAXINUS (*the Ashes*).—The white ash (*F. Americana*) in favorable conditions grows to the height of 80 feet, with a straight symmetrical trunk 3 feet in diameter above the swell of the roots. It is justly estimated as among the most important of the timber trees, being particularly valued for wagon, carriage, and car building, agricultural implements, and the handles of spades, hoes, scythes, &c., and for staves and oars. It is also used for flooring and many other purposes requiring lightness, elasticity, and strength.

The black, water or hoop ash (*F. sambucifolia*) grows in swampy soil to a diameter of 2 and 2½ feet and to the height of 70 to 80 feet. In this State it is sometimes used as posts. The wood is peeled into strips for baskets and chair-bottoms, and it is sometimes sawn into lumber. It is not mentioned as useful in cabinet making, but this wood in some portions of the Northern States has come into great demand of recent years for this purpose.

The blue ash (*F. quadrangulata*) is mostly found in the western part, adjacent to Southern Ohio and Kentucky, and it occurs in better conditions in Tennessee. It is much used for lumber, and especially for flooring, and in some places made into shingles.

The green or walnut-leaved ash (*F. Viridis*) is a much smaller tree than the preceding, and occurs most frequently along the Ohio and Monongahela rivers. Its wood is used for the same purposes when of sufficient size.

GLEDITSCHIA (*the Honey Locust*).—This tree prefers a deep rich soil, and grows to the height of 70 to 80 feet, with a diameter of 3 to 4 feet, being usually associated with the black walnut, red elm, common locust, &c. Its wood is very hard and heavy, but the grain is coarse and it is deemed of little value except as an ornamental tree. Only one species (*G. tricanthos*) is mentioned as growing native in this State.

ILEX (*the Holly*).—The common holly (*I. opaca*) grows mainly among mountain streams, in gravelly or sandy soil, and in favorable conditions to the height of 30 feet. The wood is very close grained, firm, and white, and is used for inlaying and the finer kinds of cabinet work. The bark and berries have medicinal properties. Two or three deciduous species may probably be found, but they are small and of no account for their wood.

JUGLANS (*the Black Walnut and Butternut*).—Of this genus the black walnut (*J. nigra*) deserves a high rank in the list of valuable timber trees. It occurs diffused in rich soils throughout the State, growing sometimes to the height of 80 to 90 feet, with an extreme diameter of 9 feet. It is more commonly from 50 to 80 feet high, with a diameter of 3 to 6 feet. It prefers deep calcareous loams, full of vegetable matter, and is quite abundant in the plateau region. The wood is highly prized for cabinet work and the inside finishing of houses, and veneers cut from stumps, knots, and the crotches of trees take an exceedingly beautiful finish. In the amount and value of this timber it is claimed that West Virginia is rivaled among the Appalachian States only by Tennessee.

The butternut (*J. cinerea*) is a smaller tree than the preceding, is less common, and its lumber is not as highly valued. It prefers the margin of streams and rich northern slopes.

JUNIPERUS (*the Red Cedar, &c.*).—The red cedar (*J. Virginiana*) grows in this State to the height of 60 to 90 feet and to a diameter of 2 to 3 feet, and is found in a great variety of soils, as well upon the hills as along streams. The wood is highly valued for buckets, tubs, pails, &c., and is exported in considerable quantities, either in round or square logs. Its durability when used for fence-posts is well known.

KALMIA (*the Laurel*).—The mountain laurel (*K. latifolia*) is very abundant upon

rocky hills. Its wood, though small, is very hard and fine-grained, and much used for small articles and in rustic furniture.

LIQUIDAMBAR (*the Sweet Gum*).—This tree (*L. styraciflua*) prefers wet, marshy grounds and grows to a large size, but in this State is not much used, excepting for coarse work. It is difficult to split or burn, and decays rapidly when exposed to the elements.

LIRIODENDRON (*the Tulip Tree, or Yellow Poplar*).—This tree, universally known in this State as "poplar," is by far the finest tree in the forest, and nowhere does it attain grander dimensions than in West Virginia. It often reaches a height of 120 to 140 feet and a diameter of 7 to 8 and 9 feet, with a distance of 80 feet to the first limb. Several trees are reported as 10 and 11 feet in diameter. This species grows in deep, loamy, and fertile soils, and especially prefers rich bottom-lands. It is found in best conditions where sheltered from the winds and exposed to air and light. The wood is fine-grained, easily worked, rather light, and of various shades of color and quality, depending upon the conditions in which it has grown. The "yellow poplar" is much the finest variety, and much used for inside finishing, weather-boarding, shingles, &c.; and for furniture, the foundation for veneering, and for fences. The "white poplar" grows on gravelly, elevated grounds, has not so high a trunk, and its wood is coarser, harder, and more liable to decay. The "blue poplar" has the same general qualities, but being much less valued than the variety first named.

Great quantities of this timber existed in the native forests of this State, and much still remains. The finest trees were found in the central and western counties and on the affluents of the New and Kanawha rivers and the Big Sandy.

MAGNOLIA (*the Cucumber and Umbrella trees, &c.*).—The former of these occurs of a large size; and the latter is not rare, attaining the size of a small tree. The cucumber tree is not uncommon, and often used for the inside work of houses. It is well adapted for making canoes on account of its lightness and great size.

MORUS (*the Mulberry*).—The native red mulberry (*M. rubra*) sometimes grows to the height of 60 to 70 feet, with a trunk 2 feet in diameter. This height is only noticed in the forests, for in open situations it is low and spreading. The tree has a great tendency to sprout. It will grow in a great variety of soils, but best in a deep alluvial soil and in sheltered valleys. The wood is of a yellow hue, approaching lemon-yellow, and is fine-grained, compact and light. It is very durable, and is used in ship-building, being preferred for trenails to all other woods, excepting locust. It is used both for the upper and lower frame-work, for knees, floor timbers, &c.

NEGUNDO (*the Box Elder*).—The only species of this genus (*N. aceroides*) grows most abundantly on river-bottoms, and in deep, fertile soil, and farther south in Tennessee it grows to the height of 40 to 50 feet, with a diameter of 15 to 20 inches. It is not confined to the margin of streams, but grows in the woods with the locust, cherry, &c. The wood is fine-grained and saffron-colored, with a slight tinge of violet, and excepting in very old trees the proportion of sap to heart-wood is very large. It is chiefly used for fuel, although sometimes found suitable for cabinet work.

NYSSA (*the Black or Sour Gum Tree*).—The principal species of this tree found in the State is the black, yellow, or sour gum (*N. multiflora*) which grows to the height of 40 to 50 feet, with a diameter of 15 to 20 inches. It permits of a somewhat wide range of situation, growing both in dry and humid localities, but best on those that are moist and rich. When large, the trunk is generally hollow. Owing to the interlacing of its fibers, this wood is very difficult to split, for which reason it is found suitable for hubs of carts and wagons, the shaft-heads of windmills, &c., and for wooden bowls. As a fuel, it burns with great slowness.

OSTRYA (*the Ironwood*).—The only species found in the country is the *Ostrya Virginica*, sometimes called hop-hornbeam or lever-wood. It is common as a small tree in rich woods, and chiefly used for handspikes and other purposes requiring great toughness and strength. It makes an excellent fuel, but is otherwise but little used.

OXYDENDRUM (*the Sour-Wood*).—The only species of this genus (*O. arboreum*) grows from 15 to 40 feet, and occasionally attains a diameter of 2 or 2½ feet, a large proportion being sap-wood, which is white and soft. It is not in sufficient abundance to be of importance, and grows chiefly in rich woods along the Alleghany range.

PICEA (*the Spruce*).—The black spruce (*Picea nigra*) grows quite common in the higher and colder parts of the State, on the banks of streams and on cold mountain-sides. It is known under various names as "black fir," "black spruce," "white spruce," and "yew" or "yew-pine," and forms a handsome symmetrical tree, from 60 to 70 feet in height and from 2 to 3 feet in diameter. Being for the most part inaccessible, it has not been used to much extent as timber. Great numbers of this tree are to be found in suitable locations all through the Alleghanies, the foot-hills near them, and the deep, well-shaded hollows of the high plateau regions. In the region of country around the head-waters of the Gauley, Elk, and Cheat rivers vast numbers of this tree are found.

For this reason the district in question is called by the natives the "yew-pine region." According to Mr. Cecil Clay, president of the Saint Laurence Boom and Manufacturing Company, this tree will often cut 20,000 feet per acre in this part of the country. Dense masses of it cover the mountains here, the trees growing clear and tall, with trunks several feet in diameter.

In reply to further inquiries respecting this tree a correspondent says:

"It is locally known exclusively as the 'Yew,' or 'Cheat Mountain Pine,' and confined to an area of country lying immediately at the head-waters of all the Virginia streams in the Cheat Mountain range. I have never seen it growing at an altitude less than 3,000 feet above sea-level, and then in the head of the western and northern hollows, where frequently under its dense shade, among the moss-covered rocks, snow and ice are found in midsummer. The section where it grows is known as the apex of the Virginias, where within a radius of twenty miles, rise the head-waters of all the important Virginia streams—the James, the Potomac, the Green Brier, the Elk, the Gauley, and the Tygert Valley, which is the principal tributary of the Monongahela River. It is a wild, unbroken wilderness, embracing an area of from 150,000 to 200,000 acres, and in many respects the most delightfully fascinating region I have explored. The mountains rise to a height of from 3,000 to 5,000 feet, the soil is rich, and there is an abundance of wild cherry, ash, linn, sugar, and various spruces. The particular tree of which I speak, white or black spruce, whichever it may be, grows on an average to a height of from 100 to 130 feet, from 40 to 60 feet without limbs, and from 2½ to 4 feet in diameter, carrying its thickness well up, the body being generally smooth. It resembles in shape and appearance the white pine, but has a smoother trunk and less limbs, a finer grain, and is freer from resinous matter. From what Evelyn says of the Norway spruce being so finely adapted to ship-masts, I think this tree must be akin to it, for its elastic properties are most remarkable. I have seen, as an experiment, a stick 60 feet long laid with each end raised on a block with no intervening support, kept for six months in that position, and yet would not spring or warp a particle. As it only grows in this inaccessible section, no opportunities have been had for testing its merit as lumber."

From specimens of the leaves inclosed there can be no doubt that this timber is the *Picea nigra*, or black spruce of the more northerly States. It extends along the Appalachian range into North Carolina, but from its growing only in remote and inaccessible places it has not been used much for lumber.

PYRUS (*the Apples and Pears*).—The mountain ash (*Pyrus Americana*) is sometimes found 20 to 30 feet in height, with a diameter of a foot or more. It has a wide range of adaptation to soils and conditions. The wood is hard, fine-grained, and may be used for the manufacture of small articles where solidity, strength, and a high polish are desired. It is well adapted to ornamental plantations.

PLATANUS (*the Sycamore*).—The button-wood, plane-tree or sycamore (*Platanus occidentalis*), grows principally along streams, and often to an immense size. It attains a height of 120 feet, and sometimes a diameter of 7 or 8 feet, although 3 and 4 feet are a more common size. The wood takes a good polish and is easily worked, but is very apt to warp, and when exposed to the weather soon decays. When old, the trees are often hollow, and then attain a great diameter—even as much as 11 or 12 feet.

POPULUS (*the Poplars and Cottonwoods*).—The common aspen (*P. tremuloides*) is common, growing to the height of from 20 to 50 feet. It has hitherto been of slight use, but lately is coming into demand for the manufacture of paper pulp. The cottonwood (*P. heterophylla*) is not very abundant, preferring moist grounds and swamps, and attaining the height of 40 to 60 feet. The wood is soft and easily worked, but has not been much used. It grows to a larger size in Tennessee and on the Mississippi, and is used chiefly as firewood.

PRUNUS (*the Plums and Cherries*).—By far the most important timber tree of this genus is the wild black-cherry (*P. serotina*) which, in this State, grows to a height of 60 to 70 feet before branching, and from 3 to 4 feet in diameter. The wood is reddish, fine-grained, solid, not liable to warp, and susceptible of fine polish. Its color and beauty improve with age, and in some respects it is almost comparable with mahogany. Although widely distributed it is perhaps most abundant near the headwaters of the Elk, Gauley, Greenbrier, and Cheat rivers, in the counties of Randolph, Pocahontas, Braxton, and Webster. Many fine trees, 4 feet in diameter, are found on Cherry and Williams rivers, and some of these will make from three to four logs of 16 feet each. Various other species of this genus occur in the State, but none of them are important as timber trees.

QUERCUS (*the Oaks*).—Over a dozen species of oaks occur in this State, the most of them timber trees and useful either for their timber or their bark. The most valuable and probably the most useful of all the trees found in this State is the white oak (*Q. alba*), which has a wide distribution and grows to a great size, attaining at times the height of 100 feet and a diameter of 6 feet. In the counties on the Little Kanawha and

to the south of the Great Kanawha, in Boone, Logan, and other counties, it attains magnificent dimensions and is found in great abundance. In dense woods it grows two-thirds or three-fourths its height clear of limbs. Although existing in a great variety of soils and situations, it thrives best in deep, rich, alluvial bottoms. An important use to which this timber is applied is the manufacture of staves, in which an immense business is transacted. It is also largely used for railroad ties.

The post oak (*Quercus obtusiloba*), called also in this State the rough or box white oak, grows on dry, thin, and gravelly soil, forming a small tree. It is very well adapted for railroad ties, being solid, tough, and durable, but on account of not splitting with facility it is unsuitable for staves.

The burr oak (*Quercus macrocarpa*) grows in rich soils to the dimensions of a middle-sized tree, and its timber has the same general qualities as that of the white oak.

The chestnut-oak (*Quercus prinus*) grows to from 60 to 80 feet in height, and has a tough, durable wood. Its bark is highly prized for tanning purposes. A variety called the yellow chestnut-oak has leaves more like those of the chestnut than the other oaks. It forms a tall tree and is common in low grounds.

The swamp white oak (*Quercus bicolor*) forms a tall tree and is common on low grounds.

The willow oak (*Quercus phellos*) grows from 30 to 80 feet in height on low sandy grounds, but is not abundant or much used.

The laurel or shingle oak (*Quercus imbricaria*) grows from 30 to 50 feet in height, and is mostly used in making shingles, but does not occur to much extent.

The Spanish oak (*Quercus falcata*) is not abundant. It is found upon dry, sandy soils, and grows to the height of 60 to 80 feet. The wood is used for staves and the bark for tanning.

The scarlet oak (*Quercus coccinea*) is common, growing on moist soils. The timber is about the same quality, and is applied to the same uses as the red oak, and the bark is used in tanning.

The red oak (*Quercus rubra*) is quite common, but does not grow to so large a size as the white oak. The timber is coarse and not durable, but is used for staves of tobacco hogsheads and flour barrels, and the bark is taken for tanning. It makes excellent timber for framing.

The black oak (*Quercus tinctoria*) grows to a height of 40 to 80 feet and in rich and poor soils. It is sawn into boards, splits easily, and is not inclined to warp. It is used for hogshead staves and flour barrels, and is durable. The bark is much used by dyers and tanners.

The pin oak (*Quercus palustris*) forms a medium sized tree, and is rather common in low grounds. The wood is hard, heavy, and coarse, but ornamental when cut to show the medullary plates. It is considered better than the red oak.

RHUS (*the sumac*).—The stag-horn sumac (*Rhus typhina*) sometimes grows to the size of a small tree. The smooth sumac (*R. glabra*) is smaller and widely distributed. The leaves are used for dyeing and tanning.

RHODODENDRON (*the great laurel*).—This tree is very abundant on rocky hills. The wood is very hard and fine-grained, and has some market value when of size for use.

ROBINIA (*the locust*).—The common locust grows to the height of 80 or 90 feet and to a diameter of 4 feet, although generally to not more than half these dimensions. It is abundant throughout the State, but grows best in a rich, sandy loam, with free exposure to the air and light. On poor soils it becomes hollow before attaining a great size. The wood is hard, heavy, and very durable, being next after the white oak. In this State several varieties are known among timber-dealers, not specifically different, but with various tints of color of the heart-wood, occasioned by soil and conditions.

1. The red locust is esteemed as by far the most beautiful and valuable. When used for posts, and seasoned before setting, it will last forty years, or twice as long as the white locust.

2. The green or yellow locust is the most common and next in value to the preceding.

3. The white locust is least valuable and much less in price. The timber of this locust is much used in ship-building, and especially for trenails. It is also prized for sills and the studding of basements, and is employed in cabinet making, &c.

SALIX (*the willows*).—There are quite a number of native species of willow in the State, the largest of which is the black willow (*S. nigra*), growing to the height of 15 or 20 feet. None of them are turned to much account. Their charcoal would be useful in making gunpowder.

SASSAFRAS.—The only species of this genus (*Sassafras officinale*) grows west of the Alleghanies to the size of a large tree, sometimes in this State attaining a height of 70 to 80 feet, with a diameter of more than 3 feet. This tree will grow in any free soil, rather preferring moist to dry, and is generally propagated by the seed. It has, however, the habit of sprouting with great persistence in half cultivated grounds. The wood of the large sassafras is of a reddish tint, somewhat compact, but quite weak and

brittle. Stripped of its bark it resists decay well, and may be used for fence posts and rails. When fresh it has the odor peculiar to the species, due to an essential oil which is most abundant in the bark of the root, but this odor is not perceived in the wood after thorough drying. It is not a good fuel, as it snaps too much. The wood of the trunk and roots, the barks, pith, and blossoms have some reputation medicinally, and the oil, as above noticed, obtained by distillation from the bark of the roots, is an officinal article in the pharmacopœia.

The sassafras further north and east is a smaller tree, attaining in Massachusetts 30 feet in height, and a diameter of 1 foot. In West Tennessee it has been found 5 feet across the stump within the bark. In Canada it is found only to the westward of the Niagara River. The wood and roots are used for a domestic dye, with copperas as a mordant.

TILIA (*the linden or basswood*).—But one species, the *Tilia Americana*, or common basswood, is mentioned in Professor F.'s list, but it is not improbable that the white linn (*T. heterophylla*) and, perhaps, one other species may occur. The basswood is one of the finest forest trees, growing often to 80 feet or more in height, with a diameter of 4 feet. It loves a deep, rich soil, is easily cultivated, and its lumber is coming more and more into use every year.

TSUGA (*the hemlock*).—The only species found in this State (*Tsuga Canadensis*), the common hemlock, or "hemlock-spruce," is much less abundant here than farther north. Dense strips of large hemlock grow upon the headwaters of the Gauley and other rivers. Its bark is used for tanning to some extent, but the timber is not much esteemed. It may prove on comparison that it is coarser and poorer in quality than that grown in the more northern States.

ULMUS (*the elms*).—There are three species of the elm found in this State, the most abundant being the white or rock elm (*Ulmus Americana*), which is widely distributed, and grows to a great size. It sometimes attains a height of 80 to 100 feet, with a diameter of from 4 to 6 feet. It prefers a deep, rich soil, and in open grounds it branches low and spreads out into a broad canopy, rendering it very desirable as a shade tree. The wood of the white elm is brownish, tough, and where exposed to alternations of wet and dry it soon decays. The inner bark is tough and fibrous, and used for making mats and other articles, and the ashes are very rich in potash.

The red or slippery elm (*Ulmus fulva*) is widely diffused, but not very abundant in this State, growing to the height of 50 or 60 feet, with a diameter of 18 to 24 inches. The wood is reddish, coarse-grained, less compact, but more durable than that of the white elm. It splits easily and, where not in contact with the ground, is durable for rails. Its mucilaginous inner bark renders it useful for medicinal purposes.

The wahoo (*Ulmus alata*) grows to a greater height but to a less diameter than the preceding. Its wood is finer, heavier, and stronger than that of the white elm, and is used in carriage making and for other purposes where toughness and strength are required.

CENSUS STATISTICS.

The census of 1880 reported concerning the forests of this State, as follows:

The forests of West Virginia, with the exception of the belts of pine and spruce confined to the higher ridges of the Alleghany Mountains, are principally composed of broad-leaved trees, the most important of which are the white and chestnut oaks (*Quercus alba* and *Q. prinus*), the black walnut (*Juglans nigra*), the yellow poplar (*Liriodendron tulipifera*), and the cherry (*Prunus serotina*).

The forests have been largely removed from the counties bordering the Ohio River, and the most valuable timbers along the principal streams, especially the black walnut, cherry, and yellow poplar, have been culled in nearly every part of the State.

The black walnut, found scattered everywhere in West Virginia, is least plentiful in the Northwestern and Ohio River counties, and most abundant along the upper waters of the rivers flowing into the Ohio through the southwestern part of the State.

Yellow poplar is found throughout the State, and is still abundant about the headwaters of nearly all the principal streams.

Large bodies of cherry are found in Greenbrier, Nicholas, Webster, and other counties immediately west of the mountains.

A large amount of hemlock (*Tsuga Canadensis*) is scattered through the valleys and ravines of the northwestern part of the State and along the western slopes of the Alleghanies.

The area still occupied by white pine (*Pinus strobus*) is estimated to extend over three hundred and ten square miles, and to contain about 990,000,000 feet of merchantable lumber. The principal centers of lumber manufacture are along the Kanawha River, at Ronceverte, Greenbrier County, at Parkersburg, and along the Upper Potomac. The lumber product of the State for the census year was 180,112,000 feet of lumber, 12,071,000 laths, 3,695,000 shingles, 41,992,000 staves, and 1,952,000 sets of headings—valued at $2,431,857.

Areas of woodland in the several counties of West Virginia, as reported in 1870 *and* 1880 *by the national census.*

Counties.	1870.				1880.			
	Total acres in farms.	Acres of woodland.	Other unimproved.	Per cent. of woodland.	Total acres in farms.	Acres of woodland.	Other unimproved.	Per cent. of woodland.
Barbour	216,224	120,446	110	55.9	219,145	94,607	2,264	43.1
Berkeley	154,792	40,004	2,981	25.9	170,059	43,087	10,882	25.3
Boone	131,451	116,689	.....	88.8	141,049	120,276	2,852	85.2
Braxton	186,543	133,479	20,827	71.5	200,780	138,673	5,758	69.3
Brooke	55,820	360	604	(?)	49,827	14,004	181	28.2
Cabell	111,799	60,802	24,131	54.4	135,693	66,239	21,877	48.8
Calhoun	78,824	67,509	.....	85.9	101,296	74,597	137	73.6
Clay	63,606	627	55,181	(?)	56,255	41,996	549	74.6
Doddridge	149,908	112,040	116	74.7	188,387	120,050	275	63.7
Fayette	244,443	5,658	202,375	(?)	182,195	128,245	3,841	70.3
Gilmer	117,874	93,586	3,567	79.4	185,864	132,195	195	71.1
Grant	176,597	113,393	59	64.2	196,019	119,105	4,334	60.7
Greenbrier	295,587	170,748	29,740	57.7	485,802	352,527	4,164	72.3
Hampshire	256,144	163,050	15,221	63.6	345,939	219,071	139	63.3
Hancock	50,493	16,941	2,605	33.5	50,525	14,301	139	28.3
Hardy	174,376	127,180	8,521	70.9	261,958	199,353	3,600	76.1
Harrison	283,783	134,608	1,687	47.4	272,559	75,423	2,216	27.6
Jackson	150,801	100,206	100	.....	223,368	134,878	578	60.3
Jefferson	110,667	17,898	524	.....	132,330	10,936	1,190	8.2
Kanawha	231,355	164,598	7,298	.....	273,303	191,017	4,159	69.9
Lewis	304,767	110,197	118,692	.....	231,522	112,918	1,486	48.8
Lincoln	99,712	84,099	.....	.....	142,916	104,713	1,710	73.3
Logan	183,962	666	169,147	(?)	237,545	210,318	5,274	88.5
McDowell	69,236	358	64,286	(?)	102,351	91,171	1,310	82.1
Marion	62,890	25,480	.....	.....	173,357	61,249	5,155	35.3
Marshall	148,445	68,992	601	.....	174,403	67,679	2,065	38.8
Mason	153,436	86,426	.....	.....	225,328	107,498	1,950	47.7
Mercer	292,965	7,762	237,890	(?)	217,906	151,539	1,718	69.5
Mineral	168,373	16,420	92,834	.....	182,011	114,493	5,762	62.9
Monongalia	192,707	80,519	143	.....	220,347	73,957	8,358	33.6
Monroe	272,819	164,630	3,429	.....	239,283	119,793	1,832	50.0
Morgan	97,300	63,301	1,270	.....	112,129	67,773	7,583	60.4
Nicholas	182,721	122,120	36,146	.....	192,532	137,525	4,352	71.4
Ohio	60,911	14,552	300	.....	70,221	11,002	4,241	15.7
Pendleton	223,936	169,895	.....	.....	297,351	228,025	1,666	76.7
Pleasants	63,517	44,552	300	.....	70,687	37,810	726	53.4
Pocahontas	336,954	6,924	286,701	(?)	307,763	216,174	34,283	70.2
Preston	278,111	160,074	15,975	.....	324,123	178,319	5,309	54.4
Putnam	115,383	74,695	4,644	.....	154,331	94,380	2,235	61.2
Raleigh	169,382	148,413	.....	87.6	173,416	127,110	290	73.3
Randolph	301,385	188,858	62,991	62.3	426,724	326,634	15,927	76.5
Ritchie	183,135	112,135	24,881	61.2	210,554	128,200	619	60.9
Roane	250,651	130,289	85,441	51.9	226,248	146,230	1,063	64.6
Summers	.....	.....	.....	.....	172,577	123,430	932	71.6
Taylor	94,272	40,457	.....	42.9	92,603	30,290	1,203	32.7
Tucker	66,095	53,017	.....	80.2	85,712	65,652	428	76.5
Tyler	117,880	72,861	.....	61.8	153,294	68,212	2,438	44.5
Upshur	155,189	95,355	62	61.4	138,385	92,413	435	66.1
Wayne	155,102	115,548	.....	70.4	241,170	164,683	3,742	67.0
Webster	69,653	62,708	.....	90.0	99,340	83,381	1,321	83.9
Wetzel	111,560	77,118	240	69.0	173,793	104,396	2,117	60.0
Wirt	96,408	75,773	574	78.6	118,830	76,183	1,955	66.7
Wood	157,709	94,428	.....	59.8	207,086	99,772	3,737	48.1
Wyoming	45,701	35,876	20	78.5	80,647	60,348	841	74.7
Total	8,528,394	4,364,405	1,583,735	51.1	10,193,779	6,180,350	221,102	66.2

In several instances, in the returns of 1870, there was an evident uncertainty in the application of the terms "woodland" and "other unimproved," and we have left the percentage in doubt. In neither of these census returns was the whole area included, and there is, perhaps, less precision in reporting woodlands and waste than in cultivated field crops. It is presented as the only information available, and it may be said to be approximately correct.

Number of saw-mills in West Virginia.

[Compiled from Judson's Saw-Mill Directory.]

Counties.	In what part of the State.	Number of saw-mills.	Principal kinds of timber sawn.
Boone	SW.	3	Poplar and walnut.
Braxton	C.	7	Pine, poplar, walnut, and oak.
Brooke	N.	1	Poplar and hard woods.
Cabell	W.	19	Yellow pine, poplar, and hard woods.
Calhoun	C.	6	Pine, poplar, and hard woods.
Clay	C.	1	Poplar and hard woods.
Doddridge	N.	3	Oak, white and yellow pine, poplar, and hard woods.
Fayette	S.	27	Poplar, hemlock, and hard woods.
Gilmer	C.	9	Poplar and hard woods.
Grant	C.	12	Poplar and hard woods.
Greenbrier	S.	13	Pine, poplar, and hard woods.
Hancock	N.	3	White and Norway pine, and white wood.
Harrison	N.	6	Oak, poplar, and hard woods.
Jackson	W.	3	Poplar and hard woods.
Kanawha	W.	13	White wood and hard woods.
Lewis	C.	27	Poplar and hard woods.
Lincoln	SW.	5	Poplar, pine, and hard woods.
Logan	SW.	1	Poplar and hard woods.
McDowell	SW.	2	Yellow pine, poplar, and hard woods.
Marshall	N.	1	Oak and poplar.
Mason	W.	9	Pine, poplar, oak, and hard woods.
Mineral	NE.	9	Hard woods.
Monongalia	N.	43	Oak, poplar, and hard woods.
Monroe	S.	6	Poplar and hard woods.
Morgan	NE.	7	Yellow pine, poplar, and hard woods.
Nicholas	C.	2	Soft and hard woods.
Ohio	N.	1	Pine, hemlock, poplar, and hard woods.
Pendleton	NE.	4	White and yellow pine, and hard woods.
Pleasants	NW.	4	Yellow pine, poplar, and hard woods.
Preston	N.	13	Poplar and hard woods.
Putnam	W.	2	Oak, poplar, and pine.
Raleigh	S.	3	White and yellow pine, poplar, and hard woods.
Ritchie	NW.	16	White and yellow pine, poplar, and hard woods.
Roane	W.	9	White and yellow pine, and hard woods.
Summers	S.	9	Oak, pine, and hard woods.
Tucker	N.	21	Hard woods.
Tyler	NW.	10	Oak, poplar, and pine.
Wayne	SW.	6	Soft and hard woods.
Wetzel	N.	18	Oak, poplar, and hard woods.
Wirt	NW.	6	Yellow pine, poplar, and hard woods.
Wood	W.	22	Poplar and hard woods.
Wyoming	SW.	6	Poplar and hard woods.

No saw-mills are mentioned in Barbour, Berkeley, Hampshire, Hardy, Jefferson, Marion, Mercer, Pocahontas, Randolph, Taylor, Upshur, or Webster counties.

Of the mills included in the above table, two hundred and eighty, or about 69 per cent., used steam; four used both steam and water; four were not specified, and the remainder used water-power.

The largest mill was at Ronceverte, Greenbrier County, with a capacity of 70,000 to 80,000 feet a day. The place most extensively engaged in the lumbering business was Weston, in Lewis County. The places having six mills or more, with their location, are shown in the following table:

Places in West Virginia that have six saw-mills or more, with their location and the principal kinds of lumber sawn.

County.	Place.	Number of saw-mills.	Kinds of timber sawn.
Cabell	Milton	9	Yellow pine, poplar, and hard wood.
Kanawha	Charleston	8	White wood and hard wood.
Lewis	Weston	21	Poplar and hard wood.
Monongalia	Morgantown	13	Hard wood.
Do	White Day	6	Oak and poplar.
Tucker	Saint George	9	Hard wood.
Wetzel	Pine Grove	8	Hard wood.
Wirt	Wirt	7	Yellow pine, poplar, and hard wood.
Wood	Parkersburg	7	Poplar and hard wood.

The terms "white wood" and "poplar" in the above tables are probably synonymous, and refer to the *Liriodendron tulipifera* or tulip poplar.

Prof. William W. Fontaine, in a chapter upon the timber of West Virginia, its distributions and development, published in the Centennial Report, elsewhere noticed, after alluding to difficulties which had formerly hindered the getting out of lumber for the markets, suggests that the State may not have much to complain of upon this point, as in the near future it may be more than repaid for any previous lack of revenue from her timbers; by having been compelled to retain them until the rapid consumption of the forests in the adjoining States, she will obtain something like an adequate return for them. The more economical means for reaching these supplies would be by short lines of narrow-gauge railroads. The greater part of the white pine of West Virginia had, in 1876, passed into the hands of Pennsylvania lumbermen; but the greatest development of the lumber interest of the State was thought to depend upon the poplar* and the hard and ornamental woods.

Of the 16,640,000 acres in the State, between 9,000,000 and 10,000,000, or from 59 to 60 per cent., was then estimated as in original forest. The older-settled counties (Jefferson, Berkeley, Harrison, Monongalia, Greenbrier, Monroe, &c.) were most largely cleared, but no estimate of the amount or proportion was given. In other parts of the State the clearings were chiefly along the principal streams, because bordered by richer lands, and, in some cases, because these streams had afforded means for floating the timber to market.

The account given in the report under notice, concerning the distribution of timber, will afford a means for comparison with the returns already quoted from our own correspondents.

The area of the State may be said to include the mountain region, the plateau region, and the hilly region—the latter including the great body of the central and western portions of the State.

The timber trees almost universally present were the white chestnut, black and red oaks, chestnut, hickory, poplar, ash, sugar-maple, hemlock, beech, locust, and black walnut, and in the hilly region constituting most of the timber. Some yellow pine was scattered very widely over the State, but mostly confined to the ridges. This and the hemlock, among the coniferous species, appear to have the widest range, and both were most at home in the plateau and mountain regions. It is said that there was formerly a considerable belt of yellow pine growing in the counties near the Ohio, and some distance back, as in Ritchie County, but this had almost disappeared, although pine knots in the soil still leave evidence of what had once existed.

The hemlock appears to have crept down from the eastern highlands, along the streams heading in them, and to have maintained its position for some distance among the deciduous species of the hilly region. Considerable bodies of this timber were found far down the Big Sandy and Guyandotte towards the Ohio, in Wyoming, Logan, and other counties.

Of the hard woods, white oak was by far the most abundant, forming perhaps a third or more of all the timber of the State, and in the hilly region of the northern part it is found of very superior quality. A white oak from Taylor County was reported 8½ feet in diameter. The white and yellow pine were to be found in that region only in scattered groves, the prevailing timber being of the deciduous kinds.

The Big Sandy and Guyandotte, with their tributaries, and the country between these rivers and the Great Kanawha were very heavily timbered and almost untouched. Along with the hard woods and hemlocks of this district some yellow pine occurred. In many parts of the State throughout this region the chestnut oak was found on the ridges, and large chestnut trees on the hill-sides, and beech rather closely confined to the vicinity of the streams. The black gum, the sweet gum, buckeye, white maple, white walnut, linden, cucumber tree, several species of the maple, elm, and ash were also found throughout the hilly region.

Eastward of this belt of deciduous timber, as we ascend the plateau, the size of these trees diminishes and the quality is poorer, excepting along the streams. The evergreens become more common, until we come to sections where the timber changes considerably, mainly by the diminution of the oak, poplar, and hickory, and the increase of the walnut, cherry, chestnut, maple, and coniferous trees. The streams flow in deep gorges, which are not precipitous, and their benches carry heavy timber, while even the tops of the ridges have good chestnut-oak. On the great upland plateaus, and especially near the heads of the streams, *i. e.*, the New River, there are vast tracts of heavy timber, with large lots of black walnut and figured maple.

*The "tulip poplar" (*Liriodendron tulipifera*) is uniformly referred to under this name wherever mentioned in West Virginia.

REPORT ON THE FORESTS OF WASHINGTON TERRITORY.

By J. P. BROWN, *Agent of the Department.*

Forty-five thousand square miles, or three-fourths of the area of Washington Territory, are to a greater or lesser extent covered with forest growth; that to the east of the Cascade Range is far less dense than the Puget Sound region, and is of a different character.

Upon the rolling lands westward of the Cascades the variety predominating is the so-called fir, *Abies Douglasii*, of which there are three subvarieties—yellow, red, and white; valuable in the order named.

The entire area of other kinds of timber, compared with that of the fir, is but one-sixth, that of fir being five-sixths, yet a great amount of other timber is mixed with the fir. Properly speaking, this is a spruce, but by common consent the term fir is used in Washington Territory.

In density of growth, the timber varies according to locality, some thin gravel lands producing but 1,000 feet of timber, board measure, per square mile, while in many fertile tracts, from 50,000 to 100,000 per acre, or 32,000,000 to 64,000,000 per square mile, are obtained. I found some tracts upon a square mile of which the incredible amount of 120,000,000 feet of fir and cedar were standing.

Loggers and mill men consider 20,000 feet per acre a good yield, yet there is very little of Puget Sound timber that will not yield more than that amount; but, owing to the wasteful manner of cutting the timber, much excellent lumber is left on the ground to be burned off when the land is needed for any purpose.

In the moist climate of Western Washington and Oregon vegetation is as rank as in the tropics. Beneath the giant cedar and fir trees is usually a dense undergrowth of shrubs from 6 to 10 feet in height, which is almost impenetrable; and in the deep shade, where the sun's rays never reach, are various ferns and mosses that hold moisture the entire year. On the ground, in every possible attitude and in every stage of decay, are logs in vast numbers covered with moss and upon which a growth of hemlock or fir trees has started. Many of these trees are now of large size. Here and there are thickets of "Devil's club," of semi-vine nature, upright, from three to six feet in height, thickly covered with thorns which penetrate the flesh when touched; marshes, even, high up on the mountains, deep and rich with a most dense vegetation of vine-maple, salmon-berry, skunk-cabbage, and filled with logs, are frequently met with.

Hundreds of square miles exist upon which few, if any, white men have ever trod, yet all are covered more or less with valuable forests.

No pine is marketed; yet upon the higher mountains excellent pine is known to exist, which will be utilized when railways penetrate the forests and open a means of reaching it.

THE FIR OF COMMERCE (*Abies Douglasii*).—Douglas spruce, known also as Oregon pine and by other local names.

This is by far the most important, most abundant, and, commercially, the most valuable of Washington trees. It is very large and tall, holding its size well up to the

top, making from three to four long logs to the tree. A medium-sized tree measured 5½ feet in diameter at the butt, clear of the bark, and 285 feet high. It was cut in logs, as follows:

	Length.	Mean diameter.
	Feet.	*Inches.*
First cut	24	61
Second cut	24	57
Third cut	34	55

The three logs scaled 13,426 feet, board measure.

Loggers find three varieties of the Douglas spruce—white, yellow, and red. The former is pronounced worthless, and is never cut.

Yellow fir has a light-colored bark 1½ inches thick. The wood is a light-yellow, compact, close-grained, the outer growth being much finer than the heart, which, when young, is of more rapid growth.

White fir has a thin, smooth bark, of a still lighter color, resembling the gum tree in appearance. It is tall and slender, has large sap-wood, and in the future will be more highly valued.

Red fir has very coarse, deeply-furrowed, rough bark, six inches thick on large trees. The wood is dark-red in color, coarse-grained, varying, however, with the character of the land on which it grows.

The uses of the fir are various. For masts and spars it is superior to all other woods, and is shipped to all parts of the world for these purposes. It is light, tough, elastic, and durable.

Puget Sound fir has become well known throughout the world. As material for ship-building it has no superior among the woods of America, experiments having demonstrated that it is equal to our finest oak. In all places and for all purposes where pine is used in building, fir may be substituted. It is shipped in large quantities to the many Pacific ports, and the demand exceeds the supply or capacity of mills to manufacture.

China, Japan, the Sandwich Islands, Australia, South and Central America, and Mexico are the principal foreign markets, while some shipments have been made to Scotland and other countries for special purposes. California, however, is the principal market, as the larger mills are owned by San Francisco capitalists, and that city is the principal shipping point and distributing center.

The lumbering industries furnish labor for more men in the Puget Sound sections than all other interests combined.

During the past year milling facilities have more than doubled; the business is increasing; new fields are being opened for the sale of lumber, with a greater foreign demand.

The means of handling logs, of managing logging camps, and of conveying logs to mill are improving as new life is infused into the business.

Timber that has heretofore been inaccessible is soon to be opened to market by the introduction of narrow-gauge logging railroads leading into the interior where the best timber is situated.

THE CEDAR (*Thuja gigantea*, or *giant arbor-vitæ*).—This is common to the mountain and hill region bordering the Sound, and extending far up into the Cascade Range. It varies in size, growth, and appearance, according to location. On some bottom lands and lower tracts it is of stunted growth, the limbs coming out near the ground, making it knotty and of inferior value, while on higher elevations it is tall, straight-grained, free from limbs for a great height from the ground, and frequently of immense size. I have measured trees 50 feet in circumference and 185 feet high, and saw one from which the lightning had severed a "sliver" that was afterwards worked into a spar 80 feet in length, so straight is the grain and easy to split into long lengths. The timber is soft, of a very light-red color, works smoothly, and makes a fine finishing lumber.

In places distant from saw-mills fine houses are built of this lumber, each board, shingle, and timber being split out and dressed by hand.

Doors, sash, and moldings are made from it, superior to those manufactured from any other wood, and extremely durable. Hoop-poles twenty feet in length are split out, and fence-posts last for many years. Piles in salt water are far more free from attacks of the *teredo* than those of other woods. Shakes, or clapboards, may be made of extreme thinness and as smooth as desired.

No dwelling ever had a finer inside finish than some I have seen where this cedar, polished and oiled, was used. When the wood is perfectly seasoned it is but little affected by the changes of atmosphere. Barrel staves of cedar are far superior to

various other woods for many purposes, lime soon destroying the ordinary cottonwood barrels. Tubs, buckets, and all articles manufactured from the giant cedar of Washington are as valuable as those made from the red cedar, *Juniperus Virginiana*, of the Eastern States.

A cedar tree is very large at the ground, the roots, like those of the cypress, spreading and bracing the tree in each direction, and then, on the cycloidal-arch principle curving and tapering rapidly, and forming a slender trunk. Hence it does not make as much lumber as a fir, which carries its size to a great height; yet the largest trees frequently make several thousand feet of lumber.

THE VINE MAPLE (*Acer circinatum*).—This is native to Oregon and Washington Territory, growing in river bottoms and moist localities of the mountain regions, on rich slopes and beaver marshes. It seldom attains the size of a tree, but sometimes is found eight inches in diameter and thirty feet high. It usually grows in thickets, many branches starting from the same roots, crowding each other into irregular spreading and trailing positions, often extending along the ground, taking root in the wet moss and earth at several places along the stem and sending up irregular laterals. Being of rapid, slender growth, it is easily crowded and its course changed by unpleasant neighbors. Probably if planted on the prairies, at proper intervals, it would become a valuable tree. The wood is very hard and fine-grained; the sap contains a large amount of saccharine matter, and is frequently made into sirup. When of sufficient size the tree is valuable for mauls and such articles as require a hard, close-grained wood.

The foliage is quite small and graceful, coloring finely in autumn. With care in early training it will doubtless make a very handsome ornamental tree, equaling the many Japanese varieties that are so much sought after for lawn-planting.

I have failed to find a single injurious insect on the vine maple.

THE CABINET MAPLE (*Acer macrophyllum*).—This tree is indigenous to the Pacific coast. It is a large-growing tree, with fine grain, very often curled, of handsome appearance, and desirable for cabinet work. The foliage is large and dense, leaves often measuring a foot in diameter, but usually 9 or 10 inches. It is quite common in rather moist localities. In places distant from saw-mills it is not properly appreciated, nor its true value known, since it is often burned to get it out of the way, as the black walnut was in early times in the Middle States. The furniture manufacturers, however, pay a good price for desirable logs or lumber cut from this tree. Lumbermen prefer it for the wooden rails of their logging roads, and, if attainable, the maple is employed for "skid roads" on account of its hardness and quality of becoming polished and smooth by friction. But the lumber destroyed on account of its use is greater in value than the actual cost would be of iron straps on a common wood rail.

THE ALDER (*Alnus Oregana*).—This is very abundant as a second growth where timber has been cut or burned, on moist hill-sides, the bottoms of streams, and generally where there is moisture. On rich alluvial soils it reaches from 2 to 3 feet in diameter, but usually 18 to 24 inches, and 30 to 50 feet high. It is greatly in demand for cabinet-work, as it takes a stain to the depth of one-fourth of an inch, and receives a gloss, being used for imitations of various hard and scarce woods. It is soft, easily worked, taking the place of the poplar or tulip tree (*Liriodendron tulipifera*), to which it is superior as a cabinet wood.

Unfortunately, the farmers who clear the bottom lands do not, as a rule, appreciate its value, and, by burning the alder to clear the land, destroy trees that in a few years would bring them more money than their land is worth.

It will not last if exposed to the weather, but decays in a year or two. The bark is used for dyeing a buff color.

THE YEW (*Taxus brevifolia*).—This is somewhat common on the lower foot-hills, but seldom of very large size. The wood is of a very hard, compact grain, equal to boxwood for pulleys and other similar uses, and is prized by axmen for mauls, wedges, &c.

I found large quantities of yew on the steep sides of the mountains of Whatcom County, at an elevation of from 2,000 to 3,000 feet above the sea-level, the trees varying from 10 to 24 inches in diameter and 30 to 35 feet high.

The seed, a single drupe one-eighth of an inch in diameter, is inclosed in a berry flesh-colored, nearly transparent, and of pleasant, honey-like taste, which is gathered and considered a delicacy by the Indians. It grows singly on the young spray of foliage near the extremity of the branch. The foliage is a very glossy, bright, handsome green, and the tree very ornamental. Doubtless the wood will be found to have a value equal to boxwood.

CRAB-APPLE (*Pyrus rivularis*).—In growth this tree is similar to the eastern variety. The wood is hard, tough, cross-grained, and suitable for rollers for saw-mills, mallets, mauls, and similar uses. The fruit is worthless. It is usually found in swamps, marshes, and rich alluvial soils near water, growing from 9 to 18 feet high.

THE COTTONWOOD (*Populus*).—This tree is found on river bottoms, and is quite abundant on the Skagit, growing to immense size, frequently to 6 and 7 feet in diameter, and 100 to 150 feet high. It is seldom used for lumber, being mostly bought by

the barrel factories. The log, being cut into the proper length, is steamed and cut by machinery into continuous rolls as it revolves about a knife, like paring an apple, these rolls or sheets forming the sides of the barrel instead of staves. The barrels thus made are not so durable as those made by hand and with staves. They are used for lime, &c.

HEMLOCK SPRUCE (*Abies mertensiana*).—This is the most graceful of all evergreens, very similar to the hemlock of the Eastern States, but said to be of better quality for lumber. The young trees are very handsome, with fine, light, spreading spray of a beautiful color. It comes as a second growth, following the fir and cedar where these have been burned off, forming very dense, impenetrable thickets. The seeds rapidly take root in the moss which covers all logs and stumps throughout the timber region. As yet it is little used, because the fir of commerce is so very abundant. It makes good lumber, while the bark is superior to the Eastern variety for tanning purposes, and is thus used to some extent. Tanneries, however, have not yet become very common.

WILD CHERRY (*Prunus mollis*).—This tree is found in considerable numbers on the bottom lands and rich hillsides. It does not attain the dimensions of the Eastern variety, that is so fast disappearing. I found some trees 20 inches in diameter, with long, slender trunks, but the majority were less than one foot in diameter.

I could not learn that this variety had been used for cabinet-work, but from the appearance of the wood no doubt exists as to its utility. The supply, however, is too limited to create any market value.

TRANSPORTATION OF LOGS.

Near the shores of Puget Sound and its tributary waters, including all logging streams, the best timber has long since been removed, but a mile or two back from water that will float logs it has scarcely been touched. As the system of moving logs on "skid roads" is not profitable for much more than a mile, and railroads have not been constructed for logging purposes to any great extent, the bulk of the timber remains practically untouched.

In the lumbering regions of the northeast snow is utilized upon which to move logs. In the south the trees are of moderate size and hauled upon wagons or beneath large timber-wheels. This is not the case in the region of Puget Sound where most of the movement of logs is in summer, snow not being available, and the trees of such giant size that no wagon would support them nor earth roads maintain the wheels. Here a roadway is graded, and small logs, preferably maple, are embedded in the earth transversely to the track and 9 feet apart, upon which dog-fish oil, the cheapest lubricator, is poured. Along these skids the logs are dragged by main force and considerable awkwardness, six and eight yoke of oxen being required for the purpose. Often a single log, 6 or 7 feet in diameter and never less than 24 feet long, more frequently 32 feet, perhaps weighing 20 tons, must be hauled over these skid roads. If it be a spar from 100 to 125 feet long and 35 tons weight, additional oxen are attached, and it is dragged to water that will float it to its destination.

Logging railroads are now being constructed, and will, in future, be the principal mode for conveying timber for longer distances. So far, these are in the most primitive style. Each builder has his preference of gauge, of material for construction, power for moving, and system of handling heavy logs. The gauge varies from 3 to 8½ feet between rails, which are usually constructed of wood, though the newer ones are steel or iron. Oxen, mules, and steam are yet competing for the privilege of furnishing the power.

The most successful roads I have observed are of iron or steel rails placed 3 feet apart, upon which light 10 or 15 ton locomotive engines draw 100 tons and upwards over an ordinary grade upon special trucks, one under each end of the longer logs. This is the best means for the transportation of timber, apart from deep water.

FOREST FIRES.

During the months of June, July, and August of 1883 a continuous drought occurred, the earth became parched, and the moss, leaves, twigs, and decaying wood dry as tinder. Especially was this the case whenever the timber had been thinned by partial clearing, forest fires of previous years, or other causes. The sun and wind thus having full access, numerous forest fires broke out in various portions of the Sound country, destroying millions of feet of timber and laying waste thousands of acres of valuable forest, besides burning many houses, fences, and other improvements about the logging camps and frontier.

No rain falling and no means being available by which the spread of the flames could be checked, the entire country seemed to be on fire; smoke obstructed the view, and interfered with navigation to a great extent. The sun was obscured, and appeared red and dim, while its heat could not penetrate the dense fog and smoke, the temperature having been cool and agreeable all summer. The causes of these fires could not be ascertained in all cases, since no man having knowledge of such origin dared give information against his careless or criminal neighbor.

In many instances it was the result of gross carelessness by those opening clearings and burning up the brush and logs, while some were started by settlers burning off logs in opening trails or roadways. Others were started by campers carelessly leaving the fire burning after preparing their meals.

The honorable Commissioner of the General Land Office endeavored to prevent these conflagrations, but the available force of the Government was too small to be effective, especially in some localities where persons, who could not see any value in the immense timber and unable to clear a farm with an ax in a lifetime, would thus succeed in a month in opening an entire township. Hence, to prepare a farm worth a few hundred dollars, millions of dollars' worth of timber was destroyed and the land rendered valueless for the next half of a century, because most of it is unfit for cultivation, being semi-mountainous, and a new forest growth will not be productive in less time.

These fires did not travel with the rapidity of those on the prairies, but advanced slowly yet surely. When a log once caught fire it could not be extinguished until the timber was consumed, sufficient dry material being at hand to convey the fire to another log, and then to the neighboring trees. If some of these trees happened to be dead the flames quickly ascended throughout their entire length. In thickets of young firs and hemlock the flames would leap from one bough to another, rapidly spreading, going higher and higher, and as a draft was thus created, seething and roaring, while crash after crash resounded, as the noble monarchs of many hundred years' growth fell and were consumed.

The timber-growth of western Washington Territory is by far the most valuable of all its resources, a single tree of the immense fir and cedar species often being worth from $100 to $150. Many tracts exist that have 100,000,000 feet, board measure, of timber per square mile, worth, when cut into lumber, $1,500,000. Probably, as an average, it may be estimated at from twelve to sixteen millions feet per section of 640 acres, which, at $7 per thousand feet, the ruling price paid at the mills during the past summer, gives from $84,000 to $112,000 per square mile, while cedar, if clear, is worth double that amount. Yet there are large quantities of timber destroyed by being cut and burned to pre-

pare the land for cultivation. If the land were valued as high as $25 per acre, it would only reach $16,000 per square mile, while the expense of clearing might swallow up four times that sum. It is therefore evident that, making a farm by destroying the valuable timber, is a most wasteful, criminal, and barbarous practice. It may be extenuated by the pre-emptor on the ground that the timber is so far from market it cannot be profitably worked into lumber, but that is not a valid excuse. The time is now near at hand when railways will be constructed to bring all this fine timber out to the sound and to a market. When the Government permits the practice of destroying timber which has required 500 years to grow to its present dimensions, and which exists in such limited quantities on our continent, solely for the purpose of obtaining land for cultivation, while there are yet millions of acres of unoccupied treeless lands, a mistake has been committed which will require the lapse of centuries to correct.

REPORT ON THE PRODUCTION OF MAPLE SUGAR IN THE UNITED STATES AND CANADA.

By FRANKLIN B. HOUGH, *Agent of the Department of Agriculture.*

[Read before the American Forestry Congress at its session held at the Department of Agriculture May 7, 1884.]

RELATIVE PLACE OF THE SUGAR FROM THE MAPLE.

Before entering particularly into consideration of the manufacture of this article, it may be remarked that, in the two forms of granulated sugar and sirup, it stands, in comparison with cane and sorghum sugar products within the United States, as follows, according to the last census:

	Pounds.
Cane sugar (in Louisiana, Georgia, Texas, Florida, Alabama, Mississippi, and South Carolina, in order of importance as here named):	
Sugar, 178,872 hogheads (at 1,000 pounds each)	178,872,000
Molasses, 16,573,279 gallons (at 8 pounds to the gallon)	132,586,184
Total	311,458,184
Sorghum (every State and Territory represented in 1880, except the District of Columbia, Maine, Montana, New Hampshire, Rhode Island, Vermont, and Wyoming):	
Sugar	12,759
Molasses, 28,444,202 gallons (at 8 pounds to the gallon)	227,553,616
Total	227,566,375
Maple sugar	36,576,061
Sirup, 1,796,048 gallons (at 8 pounds to the gallon)	14,368,384
Total	50,944,445
General total	589,969,008

These totals expressed in percentages give, for both forms united, about 53 per cent. of cane, 39 of sorghum, and 8 of maple; of granulated sugar about 83 per cent. is from the cane, 17 from the maple, and a very small fraction of 1 per cent of sorghum; of sirup, or molasses, about 60 per cent. came from the sorghum, 35 per cent. from the cane, and 5 per cent. from the maple.

THE SPECIES USED IN MAKING MAPLE SUGAR.

The tree yielding the maple sugar, as is well known, is the *Acer saccharinum*, known by the common names of "hard maple," from the solidity and hardness of its wood as compared with that of other species of the genus, or "sugar maple," "sugar tree," or simply "sugar," from the saccharine qualities of its sap. A variety known by some botanists as the *Acer nigrans*, commonly known as "rock maple," prevails in the Western States, and in yield of sugar is considered about equal or by some even superior to the species first named. The white or soft maples (*Acer rubrum* and *A. dasycarpum*) are known to yield a sweetish sap,

and several authors (Michaux, Emerson, Thompson, in History of Vermont) state that its strength is about half of that yielded by the true sugar maple. An intelligent correspondent in Southwestern New Hampshire informs us that the *Acer rubrum* is tapped in that region as frequently as the true sugar maple, and that the sap is really about of like value. It is probable that a wide range of difference exists in this as in the proper sugar maple, and that much depends upon the soil and exposure.

The small quantities of maple sugar reported from the Pacific coast are doubtless made from the *Acer macrophyllum* of that region, which Nuttall suggests as available for this use. The other species found in our Northern and Western States are too few in numbers and too small to be worth noticing in this connection.

In Iowa and other States west of the Mississippi, the *Negundo acer oides*, nearly allied to the maples, is sometimes tapped, and a small portion of the maple sugar reported in the census from these States may be from this tree.

A few other trees yield a sweetish sap, such as the walnut and the hickory tribes (*Juglans* and *Carya*), but I have never seen granulated sugar made from them. I have a specimen of the sirup made from the butternut (*Juglans cinerea*) before me. It is about two ounces in amount, and was derived from three quarts of sap. I could not make it granulate, but as the concentration approached the point where sugar would form in maple sap, masses of jelly, like that in boiled tapioca, appeared, and these still remain. The yield of sap from these trees is small, and in sugar-making they are of no value.

DISTRIBUTION OF THE SUGAR MAPLE.

The sugar maple is the largest and most important species of the genus, and grows to greatest perfection in the colder portions of the United States and Canada. Its northern limit is bounded by a line running southwest and then westward from the mouth of the Saguenay River to Lake Superior. Westward it does not extend much beyond the Mississippi, although small colonies of this tree occur as far west as Nebraska and Kansas. Along the extreme northern border of Minnesota and in Manitoba it occurs somewhat sparingly, but not much beyond the Lake of the Woods. Southward it follows the Appalachian range into the northern border of the Gulf States, and to a limited extent into Arkansas, where it is found in the rich valleys of the mountains, occurring sparingly as far southwest as the north tributaries of the Red River. It is used for making sugar, and, as an intelligent correspondent thinks, much more extensively than is reported in the census. The variety *A. nigrans* is found in that State, but more in the lowlands.

A few small trees of this species occur in Newfoundland. The farthest easterly point at which maple sugar is made is upon the Magdalen Islands, in the Province of Quebec.

CHARACTERISTICS AND REQUIREMENTS OF THE SUGAR MAPLE.

This tree loves a strong, rich limestone soil, although one derived from decomposed shales and slates, if it has calcareous and alkaline qualities sufficient, agrees with it perfectly. It does not thrive in a deep sandy soil, nor in a strong clay, nor in a situation that is permanently wet, and for these reasons it is not found associated with the pines nor with the trees flourishing in swamps.

The sugar maple often occurs, forming the principal part of extensive deciduous forests, or interspersed with beech, birch, basswood, iron-wood, striped maple, elm, &c., and in the Western States with the tulip-poplar, buckeye, cucumber tree, oaks, and other kinds. It is occasionally found with the hemlock, but does not generally associate with the evergreen class. In a dense woodland the sugar maple carries its trunk up to 30 or 40 feet before branching, and grows to the height of 60, 80, and 100 feet with a diameter of from 2 to 4 feet. Mr. Emerson mentions a tree in Massachusetts 108 feet in height and 6 feet in diameter, that made 7½ cords of wood. In open and exposed situations it branches at from 8 to 12 feet from the ground, and grows to the height of 40 to 50 feet, with an oval symmetrical head. It is a favorite tree for planting along the highways and around dwellings. It thrives in villages, but cannot endure the smoke and dust of cities, especially where bituminous coal is burned. It is very apt to suffer in large villages from the larvæ of a wood-loving beetle, but not in rural places, where these may be prevented by insectivorous birds.

The maple is transplanted with great facility, the best success being had with young trees that have sprung up along fences and other open places, where an abundance of roots can be taken up with them. The trees are generally trimmed of their principal branches and the top is cut off, so that at the end of the first season they appear as mere poles, with a few tufts of verdure along the sides. In the second season a head will begin to form, and in three or four years they come to vigorous growth. The dead top may often be seen protruding from between the large branches for years afterwards, presenting a ready means of judging rate of growth. In open places, one or two of the lower branches usually take an exceptionally strong growth, first descending a little, and then arching upward, mingling with the rest without disturbing the symmetry of the whole.

No tree within my knowledge shows a stronger aptitude for recovering lost ground or appropriating the whole of the ground to itself than the sugar maple. Where a forest of this tree has been cut up to a sharply defined border, and where the clearing is kept fresh and fenced from cattle, the young maples will spring up after the first seed year (which comes once in two or three years) as thickly as reeds. In a few years the profile (more particularly if on the north side), instead of being abrupt, will be an inclined plane, extending several hundred feet out into the clearing, and every year will tend to gain more and more of the ground it had lost. Out of the multitude of trees thus starting many will die, but in ten years the strongest will be 6 inches or more in thickness, and their trunks very straight and high to the first limbs. If the thinning is assisted judiciously with the ax the owner will have a "sugar bush" in full vigor for use in twenty years.

I may illustrate by mentioning the trees upon my own premises within the corporate limits of Lowville village. The ground was first cleared about fifty years ago, the native timber being chiefly maple. I remember when it was so densely overgrown with young maple trees that one could scarcely get through without pressing them aside. When it came into my possession, twenty-four years ago, it had been thinned out, leaving about eighty maple trees, scattered over about 6 acres. They were very tall and slender, with high trunks before branching, and none of them more than 6 inches in diameter. Now the smallest (which I then thought might be easily transplanted) is 19 inches in diameter at 3 feet from the ground, and the largest is 28 inches at the same height. They

have ample exposure to the air and light, and the surface descends gently towards the southeast. After seed years the garden and grounds are thickly scattered over with seedling sprouts, and such of them as get a chance along the fences soon show their ability to hold their own. In some years no seeds are formed, and in 1883 the few that did form contained but one fertile seed in the pair, the other being empty.

FOLIAGE OF THE MAPLE—ITS AUTUMNAL COLORS.

The maple has a dark-green foliage, and the tree casts a dense shade. For this reason it should not be planted too near dwellings, as it would cause them to be damp and moldy.

Upon the approach of autumn—and, as some have supposed, from the effects of frost—the leaves assume the most brilliant hues of orange and scarlet, giving to our North American scenery a splendor and beauty altogether surpassing in brilliancy the autumnal colors of Europe. This change is, in fact, altogether independent of the frost, and appears to be due to the formation of acids in the ripening process of the season, something like that which gives color to the skin of ripening fruits. We have other trees that take on in autumn a more fiery red, and some a darker purple or brighter yellow, but they do not generally occur in masses, and there is less variety in their hues. The sugar maple possesses, beyond all comparison, an intensity and variety of colors that, pervading a whole landscape at once and softening in hues at different distances, renders the effect harmoniously complete.

Dr. J. G. Kohl, the German traveler and geographer, passed through our northern lake region thirty years ago, and his extensive range of observation entitles his opinions to confidence in comparing different countries. He was remarkably impressed with this feature of autumnal scenery in the Northern States and Canada, and recurs time and again to the subject in his journal, as if he could never be satisfied with admiring it. He says:

> The trees here still gloried in the rich coloring of their leafage. * * * The elegant and much prized maple was conspicuous among them, as it mostly is in Canada, and its leaves exhibited more shades and gradations of golden yellow and crimson than can be found in the best-furnished color-box. Even when you walk on dark, cloudy days in the forest, the trees shed around you such gorgeous colors that you might imagine it was a bright sunlight. You seem to be walking in the midst of some magic sunset of the declining year. * * * Sometimes the Canadians would ask me, in their glorious woods, whether I had ever seen anything like them in Europe, and if I answered that, though their woods were especially beautiful, I had elsewhere observed red and yellow autumn leaves, they would smile and shake their heads, as if they meant to say that a stranger could never appreciate the beauties of a Canadian forest thus dying in golden flame. I have seen a Swiss, born and bred among the Alps, smile just as pityingly at the enthusiasm of strangers for their mountains, evidently regarding it as a mere momentary flare, and that they only could know how to value the charms of their native land.

This coloring of maple leaves in autumn does not come on at once, but begins upon certain branches first. I have carefully noticed this feature, and find that the small branches coming out of the large ones, or from the main trunk, that have not grown much within the year, and are tending to dry up and drop off, are the first to show the colors, evidently because their leaves ripen first. On hard, sterile land, some particular branch may have made a more vigorous growth than the rest, and this will remain green after the remainder has become colored. Dr. Kohl noticed the effect of this, without suggesting a cause, and remarks:

> The magnificent coloring of these trees strikes you most, I think, when the *gilding* has only just begun, and the green, yellow, and scarlet tints are mingled with the

most delicious transitions. Sometimes it seems as if nature were amusing herself with these graceful playthings, for you see green trees twisted about with garlands of rich, red leaves, like wreaths of roses, and then again red trees where the garlands are green. I followed with delight, too, the series of changes, from the most brilliant crimson to the darkest claret color, then to a rich brown, which passed into the cold gray of winter. It seems to me evident that the sun in this climate has some quite peculiar power in its beams, and that the faintest tint of the autumnal foliage has a pure intensity of color that you do not see in Europe. Possibly you may see the climate and character of Canada mirrored in these autumn leaves, and in its rapid and violent transitions of heat and cold, the causes that produce these vivid contrasts.

The Canadians have adopted the *maple leaf* as the favorite emblem of their country, doubtless on account of the striking peculiarities of autumnal coloring that we have here described. In connection with this subject of autumnal colors it may be remarked that it is much more brilliant in Norway and Sweden than in the countries further south, affording another evidence of the effect of climate upon the ripening process in the leaves.

THE SAP SEASON.

It may be said in a general way that maple sap will flow at any time during the dormant period of vegetation, from the beginning of frosty weather in autumn until its disappearance in the spring. Frost appears to be absolutely essential to the operation, and hence no sugar can be made from the maple in warm climates, even if the tree could be successfully grown in a country where there is not a distinct alternation of cold and warm weather.

But in our latitudes, where it thrives perfectly, although I have obtained sap and made sugar in every month of winter, a most serious risk is found to be incurred in tapping too early, on account of the loosening of the bark from frost.

About a dozen years ago one of my maples was tapped on a very warm day in February, and a fine flow of sap obtained. It was on the south side of the tree, and fully exposed to the sun. An intense and protracted frost followed; no more sap ran from the hole when the sugar season came on, and it was found the next summer that the bark was loosened to the length of six feet and the breadth of one foot, with the hole formed by tapping in the center. It has since been growing over, and in three or four years will be closed up; but there is a decided flattening that can never be repaired by future growth, and an amount of dead wood within that must weaken the strength of the tree to the end of its life.

A record made in the northern part of this town (Lowville, N. Y.) by Mr. Benjamin Davenport, from 1830 to 1851, shows the dates of beginning and ending of the sugar season, as observed on the same farm (with some interruptions), through a period of twenty-two years, as follows:

Year.	Begun.	Ended.	Days of duration.	Year.	Begun.	Ended.	Days of duration.
1830	Mar. 20	Apr. 19	31	1842	Mar. 15	Apr. 17	34
1831	Mar. 14	Apr. 18	36	1843	Apr. 11	.....	.....
1832	Mar. 15	Apr. 18	35	1844	Mar. 11	Apr. 9	30
1833	Mar. 23	Apr. 12	21	1845	Mar. 7	.....	.....
1834	Feb. 22	Apr. 5	43	1846	Mar. 19	Apr. 7	20
1835	Mar. 11	.....	.....	1847	Mar. 26	Apr. 26	32
1836	Apr. 17	May 2	16	1848	Mar. 23	Apr. 10	19
1838	Mar. 13	Apr. 26	45	1850	Apr. 2	Apr. 9	8
1839	Mar. 20	Apr. 24	36	1851	Mar. 15	.....	.....
1840	Apr. 2	.....	.....				

It appears that the earliest date of beginning was February 22, in 1834, and the latest, April 17, in 1836, a difference of fifty-four days. The earliest ending was April 5, in 1834, and the latest, May 2, in 1836, a difference of twenty-seven days. The mean date of beginning for the whole period was March 20. The longest period was forty-three days, in 1834, and the shortest, eight days, in 1850. The mean duration in fourteen years was twenty-nine days.

It will be seen from this table that the dates of beginning and the duration have a wide range, some years being almost eight weeks earlier than others, and that while in one year it may be over six weeks in duration, it may be in another year but little over a week. From my own observation, but without records to demonstrate it, it seems that the duration of the sugar season is shorter in recent years. It begins much sooner in open, sunny exposures than on a northern slope, and upon the opposite sides of a range of hills running east and west it would be nearly over on the southern slope before it had begun on the northern. The duration appears to depend somewhat upon the depth of snow and the time that it remains on.*

But, from whatever causes, as the vernal equinox draws near, or a change in the season incident to the end of winter, there is something in the bright skies and warm sun that gives assurances of returning spring, and the first labors of the farmer begin in the sugar-camp, some weeks before he could be employed in the fields. As an economical question the sugar crop may be regarded as so much clear gain, because it is produced at a time of year when little else can be done.

THE DIFFERENCES OBSERVED IN THE FLOW OF SAP.

It is a matter of constant observation that trees differ, not only in the quantity but in the sweetness of their sap. Some correspondents estimate the amount of sap required for making one pound of sugar at four gallons. In my own experience in certain "runs" it comes nearer three. One estimates "from 2 to 4 gallons."

It is observed that trees standing in hollow places yield much more sap than those upon dry knolls. A smooth bark on a full-grown tree is considered an indication of vigorous growth and an abundant yield of sap. In some seasons the sap appears to be sweeter than others, and it changes during the same season, the sweetest being that which is first obtained. It is generally believed that the sweetness of the sap increases after repeated tapping. It is certain that second-growth trees with full exposure to the air and light yield sweeter sap and more of it than those growing in the deep shade of a forest. Some believe that the sap from shallow boring is sweeter than that obtained from a deep hole, but this has not been tested by experiment within my knowledge.

The only polariscope tests of the percentage of sugar in maple sap that I have noticed are those reported by Professor Wiley at the Saratoga meeting of the American Association for the Advancement of Science, in 1879. They were taken upon two days, March 21 and March 25, and show, upon twelve trees, a percentage ranging from 1.87 to 3.95, and in every instance a higher percentage on the first of these dates, the difference in one case being 1.08 per cent. He mentions one instance where the percentage was 4.30, and thought it might occasionally amount to 2 or 3 per cent. above that.

* In Southeastern Indiana the average sugar season begins about the middle of February. In the Province of Quebec it is seldom earlier than the first week, or often the middle of April.

Some experiments made upon the pressure of sap at the Massachusetts State Agricultural College in 1873–'74, by President William S. Clark and associates, deserve notice in this connection. They were applied to the sugar and the striped maples, the white and yellow birches, the hornbeam, butternut, ironwood, and the native grape-vine, and consisted in connecting mercurial gauges to these trees and vines, so that the pressure either way was indicated upon a scale. It was found that at times, when the sap did not run, there was an inward pressure or suction, amounting in the maple to a column of mercury 23 inches in height, while at other times, when the sap was running, the outward pressure equaled a column from 35 to 46 inches in height. When gauges were applied at different heights upon the same tree the lower one showed the greater pressure, amounting to the difference due to hydrostatic weight between the two points. Metal tubes driven deeply into the heart of a tree were found to yield sap for a much longer time than those that were shallow, but the quantity was less.

The birch was found to yield sap in vastly greater quantity than the maple, it amounting to 63 pounds in one day, and in less than two months 1,486 pounds were obtained.* It is stated, as one of the results of these experiments, that the flow of sap increased up to 12 feet. I have this season tried an experiment by placing five buckets in a vertical line upon a tree, at intervals of 4 feet 6 inches. The lower one, at 3 feet from the ground, gave at least twice as much sap as any of the others, and would run at times when those above it did not. There appeared to be a decrease in flow from below upwards, excepting that the upper one flowed better than the three next below it, which I attributed to the fact that it was directly under a strong branch. This leads me to remark that, to secure a large flow of sap, the tree should be tapped over a vigorous root.

---

*We have never known the sap of the birch to be used for any purpose within the United States at the present time. It it said by Michaux (*Sylva Am.*, ii, p 75) that the sap of the European birch (*Betula alba*) affords upon evaporation a sirup rich and sugary, but incapable of crystallization, and that by the addition of fermenting matter this sap is converted into beer, into a species of wine, or into vinegar, and he adds that all the valuable properties of this species are completely united in the canoe birch of North America.

The use of birch sap for the preparation of a fermented liquor is set forth by Evelyn in his *Sylva*, in several pages of text, with various recipes for the making of birch wine. A contemporary writer, John Woolidge, in his Systema Agriculturæ, 1687, p. 95, in referring to the same subject, says: "This tree yields the best sap of any tree in England, and the most in quantity. Prepared either with honey or sugar into a wine, which being now frequently made, hath obtained the name of birch wine, being a very pleasant and innocent liquor, and retaineth a very fine flavour of the tree it came from. Where this tree plentifully grows great quantities of this liquor may be extracted by cutting off some small branches and hanging bottles with the ends of the branches in the mouths of the bottles, into which the chrystaline liquor will distill. Several bottles may thus hang on one tree; or, by boring or cutting any part of the stem of the tree, and by a chip or the like to guide the sap into the neck of the bottle, by either of which ways great quantities of this liquor may be extracted in the month of February or beginning of March, when the sap ascends and before the spring of the leaf. It will run freely when the wind is south or west, or the sunshine warm, but not so if the weather be very cold, or in the night time. Some have reported that a birch tree will yield in twelve or fourteen days its own weight of liquor. I shall not persuade any man to believe it, although it be most evident that a few trees will yield you a great quantity of it. This liquor thus extracted and duly prepared makes a very delicate repast."

Behlen, in his *Forst- und Jagd Lexicon*, in describing the birch champagne wine, says that the sap runs best after a night frost followed by a warm day; that it is less when an east wind is blowing, and almost none at all in the heat of the day. The tapping should be done on the south side of the tree, and the hole two or three inches deep.

All correspondents agree in stating that a tree tapped on the south side will run sooner and dry up sooner than if tapped upon the north side. Where the ground is kept from thawing around the roots of a tree by a building or some other shelter on the south side of it, it will flow several days longer than if fully exposed to the sun.

METEOROLOGICAL CONDITIONS.

The state of the weather with respect to humidity and temperature has much to do with the flow of sap. We have already noticed the effect of alternate freezing and thawing, as indispensable; but sometimes the sap will stop running, although there has been a preceding frost and the temperature is mild. It does not generally run nights, although it will sometimes flow two or three days and nights continuously, after a freezing spell, more especially if it be warm and foggy. A cold north wind or a dry south wind will stop the flow, although the temperature is still above freezing. The best run is obtained on a bright, clear day, after a freezing night, with a strong west or southwest wind. In general it may be said that humidity favors and that dryness hinders the flow. An overcast sky, if the air be warm and moist, proves favorable.

THE YIELD OF SUGAR AND SAP TO A TREE.

In the best sugar districts, as in Vermont and in Northern Ohio, four or five pounds are expected on a general average in a good season. Particular trees will sometimes yield a great deal more. Dr. Rush cites a case in Montgomery County, N. Y., where 20 pounds and 1 ounce were made in nine days from one tree.* Michaux states an instance in which 33 pounds were made from one tree, and Mr. Emerson mentions another in which 175 gallons of sap had been obtained from a tree in Leverett, Mass., and if of the average strength this would make over 40 pounds of sugar. The character of the preceding winter, whether severe or mild, is generally considered as having an effect, the hard winters being favorable, and mild winters the opposite. Mr. Emerson suggests, with much reason, that the growth of the preceding summer may influence the amount and quality of the sap the next spring, by storing up a greater or less amount of saccharine material in the vessels of the wood.

A correspondent in Indiana, in speaking of the influence of the preceding season upon the amount of sugar, remarks:

> Seasons which follow a drought, and that lose the invigorating effect of late autumnal rains, are certain to be short in the saccharine element of the sap in the maple. The late growth of the vegetation appears to exhaust the reserve material of the tree, converting it into starch, or cellulose. The tree goes into winter less able to yield the sweet element in the proper season. This condition was evident in 1882, after the drought of 1881.

It will be noticed that these statements are opinions only, and that there is much to be accomplished in the way of careful and exact recorded observation before the laws which govern the amount of sugar in different seasons are fully known.

To illustrate the differences in quantity of sap and of sugar in differ-

* Letter to Thomas Jefferson on "The Sugar Maple Tree," in the third volume of the Transactions of the American Philosophical Society, first series.

ent years, I will here present a record kept upon my own premises during the last eight years:

Year.	Trees tapped.	Sap obtained.	Proximate yield per tree.	Estimated yield of sugar.
		Gallons.	*Gallons.*	*Pounds.*
1877	64	1,338	20 9	334½
1878	64	1,176	18.3	294
1879	55	1,098	20.0	274½
18-0	57	1,131	20.0	282½
1881	64	1,617	25.3	404¼
1882	64	1,518	23.7	379½
1883	59	398	6.7	99½
1884	64	1,040	16.2	260
Total		9,278		2,319
Average	61+	1,164¾	18.9	291½

It will be seen from this that the yield in 1881 and 1883 was as 4 to 1. If we had records of this kind extending through a long period of time, there might appear some periodicity in the return of favorable or unfavorable seasons, but this is yet merely a conjecture, without evidence. Some facts have been cited to show that hard or mild winters occur at fixed intervals, but more observation is needed to confirm this claim.

THE METHODS OF SUGAR-MAKING.

The pioneer settler tapped the maple with his ax, cutting two notches into the tree near the root, sloping inward and downward, and under the point where these wounds converged he drove an iron gouge, to make place for a curved wooden spout. The amount of sap was greatly increased, especially if the wound was freshened several times during the season, but it is needless to say that the trees were injured beyond recovery, and perished in a few years. To this succeeded the augur and wooden spout. The holes were at first an inch or three-quarters of an inch in diameter. The usual size is now five-eighths, but in Northern Ohio, where more sugar is made in certain favored localities than in any other part of the world, they use a three-eighths bit, and insert but one spout to a tree.

In very many cases two spouts are put in, thus increasing but not doubling the yield, while the injury, such as it is, is twice as great. The most successful manufacturers generally recommend but one spout to a tree. These spouts are now generally made of tin or galvanized cast iron, the former being deemed the best by many, although some of the latter have a special form intended to avoid compression in the outer layers of the wood that has merit. On all of these metal spouts there is a knob or a hook for suspending the bucket. Some have used simply a strip of strong tin plate, a little rounded and sharpened at one end. This is driven into the bark below the hole, but not into the wood, thus giving a free exposure to the outer layers of the wood. In this case the bucket must be hung upon a nail.

The primitive wooden sap-trough is still used in regions where but a little sugar is made, but it has generally been superseded by wooden buckets, and the latter by those of tin, which are now almost wholly employed in districts where much sugar is obtained. These differ in shape, those that are narrow and deep being less liable to be swayed by the winds; but they are more exposed to injury from freezing of the

sap. The latest improvements include a tin cover for shedding off the snow and rain and shielding from the sun. So far as I can learn, these covers have not as yet come into extensive use.

Some of the best sugar-makers in Vermont prefer buckets made of wood to those of tin. They are of cedar, turned, hooped with iron, and painted inside and out. It is claimed they are cheaper than tin, less susceptible to heat in the sun, and especially towards the end of the season less liable to get sour; and that, when acids thus form, they corrode the tin. The weight of opinion is, however, largely in favor of tin buckets. It is thought an excellent practice to scald them two or three times in the season, as well as at its beginning and end.

The native Indians could not have failed to notice that the maple, whenever the bark is broken off or any part of the wood in the root, trunk, or branches becomes wounded, will discharge a sweetish sap. If they made sugar, it must have been in extremely limited amount, from the want of kettles other than their earthen pots, until supplied by traffic with Europeans. They made sap-troughs of birch bark, and for two centuries or more have made maple sugar in their way.

The first settlers evaporated with kettles in the camp, and in places where but little is produced this is still done. With care, a good product was obtained, but with much waste of fuel, and at great risk of injury from smoke, ashes, and cinders. The first improvement upon this mode was the evaporating-pan, made from a single sheet of common iron, turned up on all sides and riveted at the ends. If very long, they were made of two sheets. These pans are from 30 to 36 inches wide, 6 inches deep, and from 6 to 12 or 15 feet long, and furnished with two or three pairs of iron handles on the sides for lifting. Their use required an "arch" or fire-place of stone or brick, consisting of parallel walls at such distance apart that the pan would rest firmly upon each side, with or without iron bars for further support. The fire-place should have a height of 18 to 24 inches, with iron bars for a grate, an iron door in front, and a brick chimney at the rear end. These pans are still largely in use, and they yield an excellent product, with far less fuel, and with very little injury from ashes, dust, or burning on of the boiling sap. They should be washed out every time they are emptied, and if by chance any part of the contents gets burned on it should be scoured off before being again used.

In kettles there is a risk of boiling over when the concentration approaches the point of sirup, and to prevent this a little butter or lard is put in. With the pans there is no risk from this. In some cases a feeding arrangement is placed so that a constant stream flows in. The pan boils to best advantage when but partly full, and it is advisable to "sirup down" often, rather than allow a large quantity to accumulate at once.

Although some continue the boiling-down to the point of sirup ready for use, it is always best to pour it off and allow time for it to cool and settle. It is thought ready for this when the liquid drops from the edge of a dipper in flakes, which it will do when reduced to about one-twentieth of its first volume. The settling is best done in large tin buckets, although some use wooden tubs, and twelve hours is sufficient for this process. It is then carefully strained off, without disturbing the sediment, and reduced by further boiling in a special boiler, to sirup or sugar, as the maker may prefer. It was formerly the general practice, and is still continued by some, to mix the white of eggs or milk with the sirup before the second boiling, in order to clarify it, upon the theory that these substances, coagulating, would bring to the surface

whatever impurities might remain. Many of the best sugar-makers, however, advise that this is wholly unnecessary. The scum upon the boiling sap should be taken off whenever it forms, and the sirup, on heating, will always have a thick scum before the boiling begins. This should be skimmed off, and with proper care no complaint will arise from this cause, although no clarifying substance is employed.

We should have remarked that with the introduction of the pan and arch it became necessary to provide a sugar-house for a shelter. This is sometimes on the outside of the woods, to secure free exposure to the winds, and so made that the sides may be thrown open when in use. The gathering is done in the large way with a team, one or two tubs, or gathering-tanks, being securely fastened upon a sled. These should have a strainer at the top, an arrangement to prevent the sap from being thrown out at the top, and a large faucet near the bottom upon one side.

Preference should be given to a hill-side, in locating the sugar-house, so that the sap may be drawn off into the storage-tubs, and from these into the evaporator, without dipping. A well-sheltered pile of dry wood should be provided, as the sugar season may often use up a considerable amount of dead wood that has no great market value, which would be otherwise wasted.

For "sugaring-off," boilers of Russia sheet-iron are now very generally employed. They are about 13 inches deep, flat bottomed, oval at the ends, from 22 to 24 inches long, and from 15 to 24 inches in width. They are usually placed on a common cooking stove, or a small special arch of masonry, where the heat can be regulated, and the risk of burning easily avoided.

Boiling sugar has a temperature of about 235° F., and the thermometer would afford one mode of ascertaining when the process was ended.* It is usual to stir off a little of the sirup in a saucer, to ascertain when it will granulate, or to pour a little upon snow. If it "waxes," and if this wax be brittle when cold, the sugar is ready to dip off for cooling, or to remove from the fire and stir until cold. Other methods of testing the degree of boiling sufficient for dry sugar are practiced to some extent. A portion of the melted sugar is dropped upon the side of a polished steel ax, where it quickly cools, and if then brittle, it is thought to be done. A twig made into a loop, with intervening space of an inch or more, when dipped into the melted sugar will bring out a film across the opening. In blowing upon this, it will swell out into a kind of bag, somewhat tubular in form, which is accounted as proof that the operation is finished.

The stirring until cold produces a whiter article, which may be dipped, like muscovado sugar, and is more convenient for use. In large operations, the sugar, cast into brick-shaped masses of 2 to 4 pounds, is found more convenient to pack and sell, and for these, wooden molds with partitions and hinges to the sides, for convenient opening, are made.

In all districts where maple sugar and sirup are produced upon an extensive scale, improved evaporators have become common and are gradually superseding the common sheet-iron pan. There are several patents upon these, and each has its advocates and friends. They are

*Mr. J. M. Whitcomb, of Enosburg, Vt., mentions the following temperatures as indicative of the degree of concentration for sugar and sirup: For sirup, from 220° to 222°; for tub sugar, 228° to 232° for large tubs; cake sugar, 245°; stirred sugar, 252°. Taking the general practice of the country, we believe that the thermometer is seldom used in sugar-making, the tests being generally as above mentioned.

generally made of galvanized iron or of heavy tin-plate, and most of them have corrugated bottoms or partitions extending alternately from one side nearly to the other, so that a current of boiling sap flows back and forth from one end, where the stream is admitted, to the other, where the sirup is discharged.

In one of these patents there is a succession of pans at different levels, and the boiling liquid is passed from one to another by means of syphons. It is needless to remark that in all of these there is need of constant attention, in order that the feed and the discharge may be regular, and that no part of the heated apparatus gets dry, for a little "buring on" imparts a disagreeable flavor to the whole.

OF THE INSOLUBLE DEPOSIT SOMETIMES FORMED IN SUGAR.

In some districts, more particularly on a limestone soil, an insoluble, sandy deposit will form near the end of the process of sugar-making, which is generally named "niter." Upon analysis, it proves to be chiefly the *malate of lime*. It is often found in Vermont, and a correspondent in Trumbull County, Ohio, speaks of having a pint or more of this light gray, sandy substance to 5 gallons of marketable sirup, where the concentration is strong. If left thin, but little is formed, and if made into sugar, it is apt to disappear in the general mass without attracting notice. I am not aware of any means by which it can be avoided, where the conditions of the soil or other causes favor its formation. In my own observation I have never seen it in noticeable quantities.

A correspondent in Vermont informs us that the "niter" does not begin to form until the sirup is reduced to 28°, and from that to 32° of the saccharometer. It is then separated by straining through a woolen cloth. This substance will burn on in the evaporator, and should be scraped and cleaned off every twenty-four hours. With him it is heavy and white. He thinks that the best sugar is made in years when there is most "niter" in the sap.

Another correspondent is of the opinion that other deposits sometimes form, and mentions the tartarate of lime as one. I have no knowledge of any analysis relating to this subject.

THE CRYSTALLIZATION OF SUGAR IN SIRUP.

Maple sirup is very apt to deposit crystals of rock candy in the jars where it is kept. These are often large, translucent, and very perfect in form; but these large crystals are not so clear and bright as those made by confectioners from cane sugar. Smaller crystals sometimes form, with bright faces and sharp angles. Three or four ounces will sometimes form in a quart of sirup, and it is seldom that a jar, after some weeks' keeping, is found without them.

The sweetness of sap is also concentrated by freezing. Upon the surface of a bucket of three gallons, there will be found, after a frost, an ounce or more of limpid sirup, intensely sweet, and having a flavor peculiarly rich and pleasant.

THE EFFECT OF TAPPING UPON THE TREES.

It is the universal belief among careful observers that the withdrawal of sap does not injure the growth of the season, nor does it shorten the life of the tree. The holes, if not larger than five-eighths of an inch, will close up in one or two years, and by the third year the layers of

growth will be continuous over them. The cavity remains behind this, and so far as it affects the strength of the trunk it may be said to injure the tree. In cutting down old maples these cavities will often be found at various depths, and for an inch or two above and below them the wood is discolored, but not rotten. I have never heard of an instance where they were thought to cause decay, excepting that of early tapping followed by loosening of the bark. In such cases, an old hole will sometimes leak a putrid brown liquid all summer long for years afterwards, and until the tree becomes rotten and hollow within. As shallow and small holes appear to serve every purpose, care should be taken not to make them deep. The cavities left are so small in proportion to the growth, their effect is imperceptible. As the outer bark has no life, the holes made by tapping will show in it until they finally scale off.

I have known of a sugar bush which had been annually tapped for seventy years and was still in good condition. Of course, trees had grown old and died, but younger ones came on to replace them, and as a unit the grove remained. A sugar bush ought not to be pastured, as cattle destroy the young growth, and the ruin, although it may be remote, is certain. Care should be taken to thin out the young growth, so that only the most thrifty trees shall remain. If there is too much shade the yield of sap will be reduced, and if there be any hemlocks or other evergreens they should be removed.

THE WOOD OF THE SUGAR MAPLE, AND SOME OF ITS USES.

Mr. Marcus Bull, in his experiments made nearly sixty years ago, found the specific gravity of the sugar maple 0.644, and weighing 2,878 pounds to the cord. The dry wood yielded 21.43 per cent. of charcoal, with a specific gravity of 0.431, or 22.68 pounds to the bushel, or 617 pounds from a cord of wood, and measuring 27 bushels. Its heating qualities were rated at 60, shell-bark hickory being 100.

In the experiments made in connection with the recent census, its specific gravity was found to be 0.7114, or 44.32 pounds to the cubic foot. In fuel value, it was numbered 17 in a list of 55 woods, and in order of weight, it stood No. 12.

The wood, when first cut, is nearly white in the alburnum, although darker within, but on exposure it becomes darker, with a slightly reddish tinge. When finely finished and varnished, it has a satin-like gloss, where the fibers are waved; and under certain conditions the grain becomes contorted in a manner that affords a lumber of extraordinary beauty. In the "bird's-eye maple," the outside of the wood is covered with little pits, and when split parallel with the outside, the surface is found covered with pimples, sometimes down to near the middle of the tree. This variety of the wood is highly prized for veneers, and for inlaying with darker woods. I have known of $1,000 being paid for a single tree. Where this contortion in the grain pervades the whole trunk, a log three or four feet long, is sometimes mounted so as to revolve slowly under a strong knife, until the whole is pared off into a large sheet. If very thin, say the two-hundredth of an inch, and backed with paper, it may be used instead of wall-paper to great advantage. Maple wood is highly prized as a fuel, and for charcoal. In the distillation of acetates, it is scarcely inferior to the oak. When thoroughly seasoned, it is not liable to shrink, warp, check or twist, and is much used for wagon axles, sleigh runners, turned work of all kinds, and the inside joinery of houses, particularly for inside blinds, wainscot work,

floors, and fine work generally. It does not hold paint well, and shows to best advantage when oiled or varnished. It is wholly unfit for outside exposure, or for cooperage of any kind. It is a favorite wood in cabinet and chair making, and for shoe-pegs, lasts, tool handles, measuring scales, and a multitude of other small articles. It is wholly unfit for posts, railroad ties, or other uses where exposed to the soil or weather, but is employed with great advantage for the keels and other submerged portions of vessels. When sawn into thin sheets and glued together with the grain crossed, it is much used for perforated chair-seats, and as a foundation for veneers in piano tops, and other elaborate work.

STATISTICS OF MAPLE SUGAR AND SIRUP.

Since 1840 the national census has reported maple sugar as one of the items of agriculture, and this affords a means not only of comparing the production of different periods, but of studying the range of this industry and the relative amount of yield in various sections of the country. The following is a table by States of the amount made, and commencing with 1850 we are able to classify the sirup separately. Assuming that a gallon of sirup will make eight pounds of sugar, we have added columns in which this equivalent is represented in pounds of sugar, and thus the total production is brought together in a manner to be more easily compared.

Amount of maple sugar and maple sirup reported by the national census at five periods.

States.	Quantity of sugar and of sirup reported by the census.								Equivalent in pounds of sugar.				
	1850.		1860.		1870.		1880.		1840.	1850.	1860.	1870.	1880.
	Sugar.	Sirup.	Sugar.	Sirup.	Sugar.	Sirup.	Sugar.	Sirup.					
	Pounds.	*Gallons.*	*Pounds.*	*Gallons.*	*Pounds.*	*Gallons.*	*Pounds.*	*Gallons.*					
Alabama			228			3					228	24	
Arkansas	38	18	3,077	124	1,185	75			1,542	182	4,060	1,785	
Connecticut	50,796	665	44,259	2,277	14,266	168	44,092	2,173	51,764	56,116	63,477	15,610	61,476
Delaware		50								400			
Georgia			991	20							1,151		
Illinois	248,904	8,354	134,195	20,048	136,873	10,376	80,193	40,077	399,813	315,736	294,579	219,897	400,809
Indiana	2,921,192	180,325	1,541,761	292,908	1,332,332	2,278,880	235,117	242,084	3,727,795	4,363,792	3,885,025	3,155,372	2,171,789
Iowa	78,407	8,162	315,436	11,405	146,490	9,315	50,711	17,766	41,450	103,703	406,676	221,010	182,889
Kansas			3,742	2	398	212					3,758	2,094	
Kentucky	437,405	30,079	380,941	140,076	269,416	49,073	66,535	27,530	1,377,835	678,037	1,501,549	662,000	286,775
Maine	93,542	3,167	306,742	32,679	160,805	28,470	153,334	82,006	257,464	118,878	568,174	388,565	809,398
Maryland	47,740	1,430	63,281	2,404	70,464	374	176,076	2,043	36,206	59,180	82,513	73,456	192,420
Massachusetts	795,525	4,693	1,046,078	15,307	399,800	2,326	878,793	13,017	579,227	833,069	1,128,534	418,408	982,929
Michigan	2,439,794	19,823	4,051,822	78,998	1,781,855	23,637	3,423,149	131,990	1,329,784	2,598,378	4,683,806	1,969,951	4,479,069
Minnesota	2,950		370,669	23,038	210,467	12,722	76,972	11,407		2,950	554,973	312,243	168,228
Mississippi			99		125						99	125	
Missouri	178,910	5,636	142,028	18,289	116,980	16,317	58,964	16,224	274,853	223,998	288,340	245,516	188,756
Nebraska					10		402	202				10	2,018
New Hampshire	1,298,863	9,811	2,255,012	43,833	1,800,704	16,884	2,731,945	79,712	162,368	1,877,351	2,605,676	1,935,776	3,369,641
New Jersey	2,197	954	3,455	8,088	419	5	2,496	334	56	9,829	28,159	459	5,168
New York	10,357,484	56,539	10,816,419	131,843	6,692,040	46,048	10,693,619	266,390	10,048,109	10,809,796	11,871,163	7,060,424	12,824,789
North Carolina	27,932	704	30,845	17,759	21,257	418	4,103	582	7,163	33,564	172,917	24,601	8,759
Ohio	4,588,209	197,308	3,345,508	370,512	3,469,128	352,612	2,895,782	495,839	6,363,386	6,166,673	6,309,604	6,290,024	6,862,494
Oregon					11	30						251	
Pennsylvania	2,326,525	50,652	2,767,335	114,310	1,545,917	39,385	2,866,010	140,667	2,265,755	2,731,741	3,681,815	1,860,997	3,991,346
Rhode Island	28	4							50	60			
South Carolina			205		2						205	2	
Tennessee	158,557	7,223	115,620	74,372	134,968	4,843	31,896	3,688	258,073	216,341	710,596	173,712	60,900
Texas						5,032						40,256	
Vermont	6,349,357	5,997	9,897,781	16,253	8,894,302	12,023	11,261,077	128,091	4,647,934	6,397,333	10,027,805	8,994,486	12,285,805
Virginia	1,227,665	40,322	938,103	99,605	245,093	11,400	85,693	7,518	1,541,833	1,550,241	1,734,943	336,293	145,837
West Virginia					490,606	20,209	310,866	28,696				652,278	540,441
Wisconsin	610,976	9,874	1,584,451	83,118	507,192	31,218	498,837	58,012	135,288	689,968	2,249,305	756,936	912,933
Total	34,242,996	636,790	40,120,083	1,597,274	28,448,645	921,057	36,576,061	1,706,048	33,508,808	39,337,316	52,898,275	35,812,101	50,944,445

U. OF MICH.

In order to obtain a standard of comparison, the census of 1880 has been thoroughly consulted, and after combining the sugar and sirup into one item for each county, I have divided it by the number of thousand acres in the county, thus obtaining the relative yield within each thousand acres of area. The result shows for the whole United States, so far as reported in farms, a yield of about 95 pounds per 1,000 acres. The States rank in the following order:

States	Per 1,000 acres.	States.	Per 1,000 acres.
	Pounds.		*Pounds.*
Vermont	2,512	West Virginia	35
New Hampshire	906	Connecticut	25
New York	540	Kentucky	13
Michigan	324	Illinois	12
Massachusetts	292	Minnesota	12
Ohio	279	Iowa	8
Pennsylvania	201	Missouri	7
Maine	124	Virginia	7
Indiana	106	New Jersey	2
Wisconsin	59	Tennessee	2
Maryland	37		

Having these data prepared, I have transferred them to a map in colors. From the late Canadian census (that of 1880–'81) I have extended the coloring over the adjoining provinces of Canada, and am thus able to present the distributon of maple sugar production *of the world*, for in no other countries is there any produced.

It will be seen that while New York reports the greatest quantity, Vermont, in proportion to its area, is by far the leading State. The greatest amount is produced in the northern part and east of the Green Mountains, and the colors indicating a high rate extend across into Sullivan County, New Hampshire, and northward into the Province of Quebec.

The county showing the highest production in New York is Cortland. After this, Delaware County, in the southern part. Franklin, Saint Lawrence, Jefferson, and Lewis in the northern; Wyoming in the western, and the southern tier of counties, west of Steuben, show from 1,000 to 2,000 pounds per 1,000 acres. Excepting on its western border, New Hampshire ranks low. Maine is eighth-rate, and below the production in Canada to the north of it along the Saint Lawrence. The maritime provinces of Canada rank low. In Massachusetts none is reported east of Worcester County, and the most from the three river counties, and from Berkshire County on the west. Connecticut ranks low. Rhode Island has none. There is none in New York below the Highlands, and none in New Jersey, excepting in the extreme northern part.

In Pennsylvania, Somerset County, among the mountains in the southwestern part, takes the lead, and next to this, Potter County, adjoining the productive region of Southwestern New York. In Ohio, the production is chiefly limited to the northern part; in Michigan, to the northwestern part of the lower peninsula; in Wisconsin, the northern part west of Green Bay, and the southwestern corner. To the southward the sugar region spreads over the mountains and the region to the west, barely touching North Carolina, and fading out in Middle Tennessee. In Iowa and Missouri I have not attempted to color the map, except in one or two spots, owing to the slight importance the subject presents in those localities. In Iowa, although sugar was made in 40 of the 99 counties in the last census year, it is of no commer-

cial importance. Many farmers owning belts of woodland along the rivers have small groves and make a little for their own use. Some sugar is made from the Negundo and from the *Acer dasycarpum*, and the little manufactured in Nebraska and Kansas is from these trees. The Negundo appears to make better timber in these western States than further east, and proves towards the northward to be almost as hardy as the gray willow.

Although Ohio as a State ranks sixth on the list, yet within the area of production in the northern part the yield shows an intensity which, in certain counties, notably in Geauga and Portage, justly entitle them to rank as first in the world. For this reason it is deemed proper to quote from a recent communication received from Mr. Ezra P. Brainerd, of Ravenna, whose intelligent observation and ample opportunities enable him to present the subject in an effective manner. He says:

This is one of the few industries that is increasing in commercial importance, and with the modern improvements in machinery and fixtures it is becoming more remunerative to the producer. The Western Reserve, made up of twelve counties in Northern Ohio, produced in 1883 over 900 tons of maple sugar and 950,000 gallons of sirup. Although that was considered quite an ordinary year, still the assessors' returns in our auditor's office show that the product from the sugar-maple in Portage County alone for 1883 was 154,887 pounds of sugar and 76,381 gallons of sirup, each gallon being equivalent to 8 pounds of sugar.

Most of the sugar is cast in two and four pound bricks and packed in boxes. Some of the sirup is shipped in 15 and 20 gallon kegs. The greater portion, however, is put into five-gallon tin cans, cased with wood, and in these packages shipped all over the world. For the past six years the average price for all grades to the producer has been, for sugar, 10 cents per pound; for sirup, 80 cents per gallon. I am speaking of the Portage County market. These figures are obtained from the books of Messrs. Freeman & Horr, of Ravenna, Ohio who for the past six years have annually bought and shipped some 50 tons of sugar and 6,000 gallons of sirup. They are now filling orders from Europe.

The beginning of the sugar season is quite variable. The first of March with us is the usual time for opening the sugar camp. Now and then a few tap in February. The sugar season continues, on an average, about thirty days. Experience has proved that, if the season is early, it is better to tap on the south side of the tree; if late, on the north side. A three-eighths bit is the size now used, and tin spouts have taken the place of nearly *all others*. Very seldom more than one spout is used in a tree. Tin buckets, holding 14 to 18 quarts, are taking the place of all other vessels for catching sap except near our potteries, where an imperfect class of stone crocks can be obtained at a very low price, and are extensively used.

The average yield is quite variable. Camps where the trees are large, with the small limbs and underbrush cut out, and well exposed to the sun, yield from four to five pounds per tree in a season. Three pounds is the ordinary yield for common forest camps. The quantity of sap depends upon the season. After a severe winter, 5 gallons will often produce a pound; after a mild, open winter, it may require from 7 to 8 gallons.

The quality of the sap varies in different trees, rock maple being the richest, hard maple next. The soft maple[1] yields only about half the quantity of sugar obtained from the other two varieties. It is claimed by our best informed producers that, taking one year with another, the slope of the land where the sugar-trees are located has no perceptible influence upon the yield.

The fixtures for sugar-making are now so perfected that no necessity exists for using milk, eggs, &c., for clarifying in sugaring-off. Our best sugar-makers use nothing of the kind.

The value of forestry is now well understood generally, and sugar-trees especially. Every farmer with us looks to and protects his sugar-orchard as carefully as he does his fruit orchard, and it is becoming more and more valuable every year. He understands that the supply of pure, fine maple sugar and sirup can never equal the demand.

Of approved evaporators, there are among us several different kinds. One, known as the "Vermont," has had a large sale in Northern Ohio, and is still thought by many to be very good. The "Champion," made at Hudson, Ohio, is used to some

[1] The first two of these are understood to be varieties of the *Acer saccharinum*. The "soft maple" is probably the *A. rubrum*, or perhaps *A. dasycarpum*.

extent, and has its friends; but one called "The Success," invented and extensively manufactured by Wilcox & Son, of Garrettsville, Portage County, Ohio, is now considered by many as perfect, and the best in use. They are made of five sizes, having a capacity for evaporating from 1½ to 10 barrels per hour. Since perfecting with all the later improvements their sales have been very large, and testimonials from the several States where they are in use show that they are giving very general satisfaction. Garrettsville is one of the best points for maple-sugar making in the world. Within a circle of 3 miles there are one hundred and eleven sugar camps, containing 86,380 trees, an average of 778 to the camp, the largest having over 3,000 trees and the smallest 200.

A correspondent in Logan County, Ohio, reports the beginning of the sugar season in that region as usually from the 1st to the 15th of February, and its duration from six to eight weeks. From 1 to 4 spouts of elder are generally used and holes from three-eighths to one-half of an inch. Both wooden and tin buckets are employed and the sap is evaporated both in kettles and patent evaporators. The yield is from 2 to 3 pounds per tree, and from 6 to 8 gallons are required for a pound of sugar. Upland trees are accounted best, and large trees yield the sweetest sap. Milk or eggs are generally used for clarifying. The usual price of sugar at the end of the season is 10 cents, and of sirup 80 cents. The latter is put up in tin cans holding 1, 2, 3, and 4 gallons. Logan County stands like an island in the sea on the map of Ohio, in its sugar-producing relations. The region around Bellefontaine is understood to be the center of this industry, and the black maple (*Acer saccharum* var. *nigrum*) as the tree that affords the sugar.

There are one or two points in Canada in the neighborhood of Sault Ste Marie and the Manitoulin Islands that show a high rate of intensity over small areas, but from the imperfect data in my possession I have not been able to locate them on the map.

SUGAR STATISTICS AS REPORTED UNDER STATE AUTHORITY.

In several of the States a census has been taken under State authority, in which the amount of maple sugar and sirup is reported. The following are of this number:

IOWA.

Census of 1875, including the production of the previous year:

Pounds of maple sugar made	132,204
Gallons of maple sirup made	19,613
Estimated equivalent to both in pounds of sugar	289,108

MASSACHUSETTS.

Year.	Quantity.	Value.
	Pounds.	
1855	520,441	$52,293 42
1865	415,428	81,348 00
1875:		
Sugar, for sale	577,953	67,517 00
Sugar, for use	504,249	55,496 00
Sirup, for sale, 9,749 gallons, at 8 pounds to the gallon	655,945	11,671 00
Sirup, for use, 13,267 gallons, at 8 pounds to the gallon	610,385	15,564 00

It will be seen that the price of sugar in 1855 was about 10½ cents per pound. In 1865 (war prices being then strongly felt) it was 19½ cents. In 1875 sirup was worth a little less than $1.20 per gallon, and sugar a little over 11 cents a pound.

MICHIGAN.

The returns in this State refer to the census year and not the year previous.

	Pounds of sugar made.
1854	1,611,462
1864	4,044,399
1874	4,319,793

In the introductory remarks of the census of 1864, it is said that the sugar made from the maple was 3 pounds 3 ounces to each inhabitant in 1859, and 5 pounds to each person in 1864. It adds:

Michigan contains millions of acres of land on which the great bulk of timber is maple. The short supply and great and rapidly increasing consumption of sugar, will insure high prices for many years. Sound policy indicates that our sugar orchards should be better protected and preserved by our farmers, not only as a matter of economy but as a paying investment.

NEW YORK.

Returns of maple sugar and sirup are given in the censuses of 1855, 1865, and 1875 in each case representing the production of the spring of these years:

Years.	Sugar made.	Sirup made.	Equivalent weight of sugar.
	Pounds.	*Gallons.*	*Pounds.*
1855	4,935,816	85,092	5,613,548
1865	9,635,199	139,497	10,751,177
1875	9,272,702	240,023	11,192,886
Average	7,947,906	154,871	9,185,870

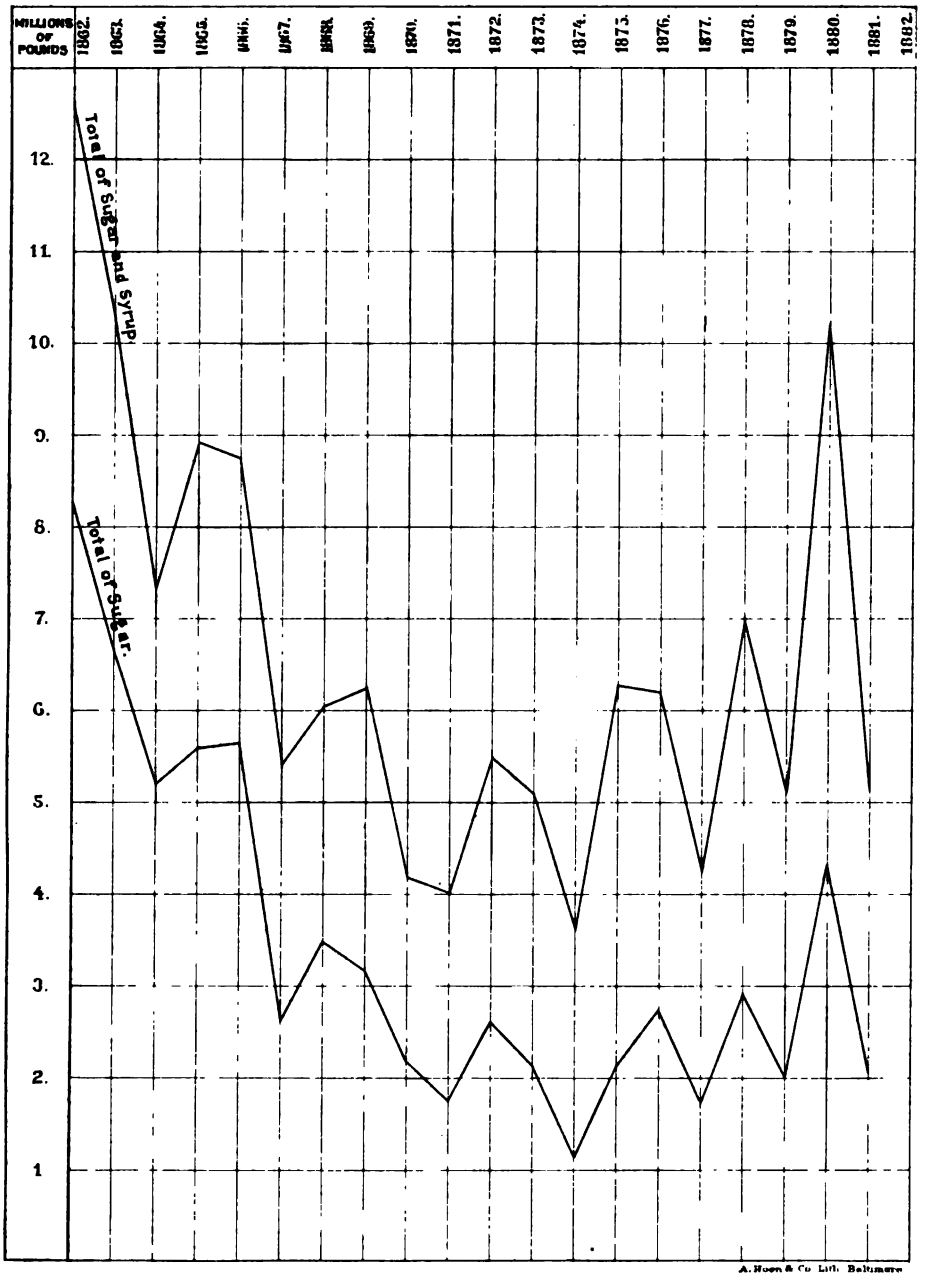
The advance in quantity in 1865 was no doubt partly due to the high prices incident to the war then in active progress. The season of 1875 was an unusually favorable one for sugar making.

OHIO.

In this State the amount of maple sugar and sirup produced is reported annually by the assessors, and refers, as I understand it, to the product of the previous year. The amount reported annually, commencing in 1862, has been as follows:

Years.	Sugar.	Sirup.	Equivalent weight of both.
	Pounds.	*Gallons.*	*Pounds.*
1862	8,284,187	538,019	12,556,339
1863	6,753,048	440,607	10,309,896
1864	5,210,187	278,347	7,733,963
1865	5,660,002	408,416	8,927,320
1866	5,657,440	393,764	8,807,553
1867	2,733,330	338,752	5,443,346
1868	3,570,932	311,991	6,066,860
1869	3,207,414	398,263	6,393,518
1870	2,204,325	256,133	4,253,389
1871	1,832,396	271,113	4,001,300
1872	2,690,011	356,390	5,540,571
1873	2,150,072	376,348	5,160,856
1874	1,248,955	302,854	3,671,787
1875	2,225,683	516,298	6,356,067
1876	2,707,051	445,835	6,272,731
1877	1,625,215	324,036	4,217,503
1878	2,987,288	510,117	7,065,224
1879	2,038,466	383,791	5,108,794
1880	4,459,115	736,286	10,349,402
1881	2,036,376	392,883	5,179,440

Graphic representation of the quantity of Sugar, and the total of both Sugar and Syrup as given in the Assessor's returns in the preceding Table.



A study of this table shows that the relative amount of sugar, as compared with sirup, has decreased considerably within the period embraced in the returns, the average for the first five years being 65.8 per cent., and for the last five years 40.7 per cent. By far the greater part of the maple sugar and sirup of Ohio is produced in the northern part, and upon the "Western Reserve." The ten counties in order of greatest abundance are Geauga, Ashtabula, Logan, Trumbull, Portage, Medina, Cuyahoga, Ashland, Lorain, and Lake.

CANADIAN STATISTICS OF MAPLE SUGAR.

The census here, also, is our only guide as to the total production, and upon five returns has been as follows:

Provinces.	1842.	1850–'51.	1860–'61.	1870–'71.	1880–'81.
Ontario (Upper Canada)	3, 699, 858	2, 212, 580	6, 970, 611	6, 247, 442	4, 169, 706
Quebec (Lower Canada)	.....	6, 057, 532	9, 324, 147	10, 497, 418	15, 687, 835
New Brunswick	.....	350, 957	230, 006	380, 004	453, 124
Nova Scotia	.....	110, 411	249, 549	151, 190	217, 481
Prince Edward Island	.....	.....	.....	.....	25, 098
Manitoba	.....	.....	.....	.....	2, 796
British Columbia	.....	.....	.....	.....	9
Total	3, 699, 858	8, 731, 510	16, 774, 313	17, 276, 054	20, 556, 049

The official from whom the returns of the last census were received, in advance of publication, remarks, that a great deal more was made in small quantities, of which no returns were reported.

The importance of this industry in the Province of Quebec justifies a more extended account by districts, which, arranged in the order of their importance, were reported in the census of 1880–'81, as follows:

Districts.	Pounds.	Districts.	Pounds.	Districts.	Pounds.
Beauce	1, 330, 803	Dorchester	248, 945	Soulanges	74, 303
Stanstead	1, 110, 845	Bagot	239, 758	Bonaventure	67, 520
Compton	839, 464	St. Hyacinthe	224, 600	Gaspé	58, 263
Brome	828, 073	Verchères	218, 070	Beauharnois	54, 375
Missisquoi	677, 854	Nicolet	211, 877	Charlevoix	53, 492
Montcalm	691, 131	Berthier	206, 877	Laval	45, 541
Richmond and Wolfe	671, 206	Maskinonge	205, 267	Iberville	42, 411
Joliette	625, 403	St. Maurice	182, 235	St. Jean	41, 282
Montmorency	544, 885	Kamouraska	175, 725	Pontiac	34, 527
Shefford	526, 678	Vaudreuil	171, 741	Levis	34, 136
Pontneuf	485, 660	Yamaska	159, 545	Jacques Cartier	31, 113
Drummond and Arthabaska	446, 815	Montcalm	146, 842	Napierville	29, 607
Temiscouata	331, 580	Terrebonne	141, 275	Laprairie	28, 526
Rouville	321, 610	Montmagny	127, 877	Quebec	26, 521
Megantic	321, 083	Huntington	116, 777	Trois Rivières	14, 590
Rimouski	313, 987	Ottawa	99, 648	Hochelaga	13, 412
Champlain	303, 292	Sherbrooke	99, 314	Chambly	6, 500
L'Islet	299, 583	Lotbinière	86, 777	Chicoutimi and Saguenay	2, 701
Deux Montagnes	293, 118	Chateauguay	85, 482	Montreal	600
Bellechasse	259, 691	Richelieu	78, 965		
		Argenteuil	77, 210		

In the Province of Ontario the largest production is north of lakes Simcoe and Couchiching, where it is made by the Indians in considerable quantities and brought down to Toronto, Hamilton, and other western towns, and bartered for provisions and other articles.

The returns of trade and navigation of the Dominion Government enable us to know the amount of exportation to foreign countries annually. The largest amount goes to the United States; next after this come

Great Britain, Newfoundland, and the British West Indies. Although Quebec is the largest producer, the greatest exportation in some years, as in 1882, has been from Ontario. The amount exported has increased greatly in recent years, as will be seen from the following totals:

Years.	Pounds.	Value.	Years.	Pounds.	Value.
1878	7,207	$782	1881	172,285	14,616
1879	1,888	192	1882	202,169	41,886
1880	119,332	7,985	1883	109,662	12,358

In conclusion, we remark that the production of maple sugar and sirup is among the agricultural industries admitting of large development within the districts favored by nature with the conditions requisite for success. The maple grove that is planted by a young man may be enjoyed by him through more than half of an ordinary life time. With proper care it will perpetuate itself through a long course of years, and for aught we know (if the young growth is protected) forever. It will occupy broken grounds that could not otherwise be cultivated, and the timber, when taken out at greatest maturity, has a value which is gaining every year, aside from the annual revenue to be derived from the sap. The maple grove adorns and beautifies perhaps more than any other of our native forest trees. The demand for pure, cleanly and carefully made maple sugar and sirup is increasing every year, as the articles become better known, and there is scarcely a possibility of overstocking the markets. The sugar season comes at a time when farm labor is least employed, and the occupation presents amenities beyond those which any other form of farm labor can afford.

INDEX.

A.

Page

Age of trees, concentric rings as test of 338–341
Alabama, forest condition of 182
lumber productions of 199–203
supplement 241
Arbor-day, origin and observance of 322
in West Virginia 377, 378
Arizona, forest condition of 111, 182
lumber productions of 203
Arkansas, forest condition of 182, 183
lumber productions of 204, 205
Artesian wells 110

B.

Baker, F. P., report of, on the condition of forests, timber-culture, &c., in Southern and Western States 105–118
on the forest condition of certain States 181–197
on the lumber productions of certain States 197–239
on the lumber productions of certain States, supplementary 239–245
Brown, J. P., report of, on the forest condition of Washington Territory 388–393

C.

Canada, maple sugar and sirup in, statistical tables 413, 414
California, forest condition of 246–254
lumber productions of 254
Circular of inquiry, copy of, B, old series 3
A, new series 4
B, new series 4, 5
No. 5 ..... 119, 120
Colorado, forest condition of 111, 183–185
lumber productions of 206, 207
Cost of tree-planting 321
Cuttings, propagation of trees by 104

D.

Dakota, trees best adapted to, by counties 9–12
summary of 12
tried in, which proved unsuccessful, by counties 12, 13
summary of 13
injury to, from insects or other causes, by counties 13–15
tree-planting in, other difficulties observed, by counties 15–17
forest condition of 255, 262
lumber productions of 262

Page.

Difficulties observed in tree-planting in Dakota 15
Illinois 28
Iowa 50
Kansas 71
Minnesota 84
Nebraska 99

E.

Europe, treatment of forests in 117
Evergreens, transplanting and treatment of 104
Experimental farms 113
Experiments in tree-planting, necessity of 116

F.

Farms, forest, experimental 113
Figures or numerals, explanation of 4
Fires, forest, in New Hampshire 361, 362
Washington Territory 392, 393
prevention of 114
Florida, lumber productions of 207-209
supplement 241
Forest fires, prevention of 114
renewing itself 115
Forest and timber-culture, condition of, in Southern and Western States.
Baker 105–118
certain States. Baker 181–197
Western States. Furnas 246–337
Forestry, schools of, and experimental farms 113
Forests, reckless destruction of 6
consumption of, for rail road (ties) 172, 173
treatment of, in Europe 117
Furnas, R. W., report of, on condition of forestry and lumber productions in certain Western States 246–337
tree growth, maximum size and age, period of decline, completion of cycle, &c 338–345
special report of, on forestry in Ohio and Indiana 346, 347

G.

Georgia, forest condition of 186
lumber, productions of 209–212
supplement 240
Government, General, duty of, in the preservation and increase of forests on the public domain 116–118

H.

Hough, F. B., report of, on kinds and quality of timber used for railroad ties, &c 119–173
on decrease of woodlands in Ohio 174–180
on the condition and lumber products of New Hampshire and West Virginia 348–387
on maple-sugar productions in the United States and Canada 394–414

Page.

I.

Idaho, forest condition of ... 263
lumber productions of ... 264
Illinois, trees best adapted to, by counties ... 17–22
summary of ... 22
tried in, which proved unsuccessful, by counties ... 22–25
summary of ... 25
injury to, from insects or other causes, by counties ... 25–28
tree-planting, difficulties observed in, by counties ... 28, 29
forest condition of ... 271–285
lumber productions of ... 286
Indiana, forest condition of ... 264–269
lumber productions of ... 270, 271
special report on forestry in. Furnas ... 346, 347
Indian Territory, forest condition of ... 186
Insects, injury of, to trees in Dakota ... 13
Illinois ... 25
Iowa ... 44
Kansas ... 65
Minnesota ... 81
Nebraska ... 95
Introduction ... 3–10
Irrigation ... 110
Iowa, trees best adapted to, by counties ... 30–38
summary of ... 38
tried in, which proved unsuccessful, by counties ... 38–44
summary of ... 44
injury to, from insects or other causes, by counties ... 44–50
tree-planting, difficulties observed in, by counties ... 50–55
forest condition of ... 287–301
lumber productions of ... 301, 302
maple sugar and sirup in, statistical table ... 411

K.

Kansas, forestry in ... 109
trees best adapted to, by counties ... 55–61
summary of ... 61
tried, which proved unsuccessful, by counties ... 61–65
summary of ... 65
injury to, from insects or other causes, by counties ... 65–71
tree-planting, difficulties observed in, by counties ... 71
forest condition of ... 186–196
lumber productions of ... 212, 213
supplement ... 244
Kentucky, forest condition of ... 191, 192
lumber productions of ... 214–216
supplement ... 243

L.

Louisiana, forest condition of ... 192, 193
lumber productions of ... 217, 218
supplement ... 242

Page.
Lumber, productions of, in certain States. Baker 197–239
supplement 239–245
the United States. (*See* individual States and Territories.)
Lumber and wood trade in Southern and Western States 196–337

M.

Maple sugar, production of, in the United States and Canada. Hough 394–414
species of trees used in making 394, 395
methods of making 402–405
and sirup, statistical tables of, &c 407–414
in Canada, statistical table 413, 414
Iowa, statistical table 411
Massachusetts, statistical table 411
Michigan, statistical table 412
New York, statistical table 412
Ohio, statistical table 412
Massachusetts, maple sugar and sirup in 411
Michigan, maple sugar and sirup in 412
Minnesota, trees best adapted to, by counties 75–78
summary of 78
tried, which proved unsuccessful, by counties 79–81
summary of 81
injury to, from insects or other causes, by counties 81–84
tree-planting, difficulties observed in, by counties 84–86
forest condition of 303–313
lumber productions of 313, 314
Mississippi, forest condition of 193, 194
lumber productions of 218–221
supplement 242
Missouri, forest condition of 194–196
lumber productions of 222–226
supplement 243
Montana, forest condition of 314–317

N.

Nebraska, trees best adapted to, by counties 86–91
summary of 91
tried, which proved unsuccessful, by counties 92–95
summary of 95
injury to, from insects or other causes, by counties 95–99
tree-planting, difficulties observed in, by counties 99–103
forest condition of 317–325
extent of tree-planting and growing in 317, 318
useful and valuable variety of trees in 318, 319
rate of growth of trees in, statistical table 320–339
trees, order of value of, in 320
planting and price of seedlings 321
cost of planting, in 321
importance of spontaneous growth of, in 323
arbor-day in 322
modes of planting and treatment of trees in 322
laws encouraging tree-planting in 322
table showing the number of trees planted under the timber act in .. 325

Page.
Nevada, forest condition and timber productions of 325
New Hampshire, forest condition of..... 348–350
ship-building interest in..... 350, 351
number of saw-mills and kinds of timber sawn in 351
legislative action relating to forestry in..... 352, 353
important lumbering operations in..... 353–355
ancient timber regulations in 355–358
lumber manufactories, amount manufactured, kinds of timber sawn, size of timber employed, &c..... 358–361
forest fires in..... 361, 362
on cutting timber, the supply, deterioration, &c 362–366
New Mexico, forest condition of..... 196, 197
lumber productions of..... 227–230
supplement..... 244
New York, maple sugar and sirup in, statistical table..... 412
North Carolina, lumber productions of 227–230
supplement..... 239
Nut-bearing trees, treatment of..... 103

O.

Ohio, woodlands of, percentage, &c., of the, statistical table..... 174–180
in, decrease of..... 174–180
diagrams showing percentages of woodland in..... 181
statistics of manufactures from woods grown in 347
special report on forestry in. Furnas..... 346, 347
maple sugar and sirup in, statistical table..... 412
Oregon, forest condition of..... 246–254
lumber productions of..... 254

P.

Planting seeds, time for..... 103, 104
trees, time for..... 103, 104
preparation of soil before..... 103, 104
Prairies, why treeless..... 4
encouragements for planting 4

R.

Railroads and tree-planting 113
names and length of, including branches and connecting lines in the United States..... 120–134
miles of track of, in the United States, statistical table..... 172
increase in mileage of, in the United States (see note)..... 173
consumption of timber by..... 173
Railroad ties, best timber for, in the order of preference..... 144–149
best time for cutting..... 149–165
cost of..... 137–144
diagrams of 167
durability of 137–144
kinds of timber used for..... 137–144
hewn or sawed, which preferred..... 149–165
number and size of, per mile..... 135–136
number of, in use, statistical table..... 172
required annually, statistical table..... 172
processes for preserving..... 165–171

Page.
Railroad ties, substitutes for wood for 171
where obtained by different companies 149–165
Rings, concentric, as indications of age of trees 338–341
Roads and streets, tree-planting on 116

S.

Schools of forestry and experimental farms 113
Seeds and young plants, collection and preservation of 103, 104
time for planting 103, 104
Soil, preparation of, before planting 103, 104
South Carolina, forest condition of 197
lumber productions of 230–233
supplement 239
Southern forests, future of 108
Southern States, condition of forests in the 105–245
Streets and roads, tree-planting on 116
Sugar maple, distribution and characteristic requirements of 395–397
time for gathering sap of 398, 399
observations on flow of sap of 399, 400
meteorological conditions of 401
yield of sap and sugar to a tree 401, 402
methods of sugar-making 402–405
the effect on trees of tapping 405, 406
some of the uses made of the woods, &c 406
amount of sugar and sirup made in each State 408
map showing distribution of production of, in United States .. 415
Symbols, explanation of 4, 9

T.

Tennessee, forest condition of 197
lumber productions of 233–235
supplement 242
Ties, railroad, size of, number per mile, durability, cost, timber used, &c 135–165
processes of preserving 165–171
substitutes for wood for 171, 172
consumption of forests for 172, 173
Timber-culture, &c., report on, in Southern and Western States. Baker 105
act 115
Timber, kinds of, used for railroad ties 137–144
summary of 144, 149
used for ties, its durability, summary of 144–149
the prices of, summary of 144–149
the best in the order of preference 144–149
where obtained by different companies 149–165
act, national, importance of a 324
Trees best adapted to Dakota, by counties 9
Illinois, by counties 17
Iowa, by counties 30
Kansas, by counties 55
Minnesota, by counties 75
Nebraska, by counties 86
concentric rings as a test of age 338–341
cultivation of 103, 104
intervals between 103, 104

Page.
Trees, kinds of, which promise to be most profitable 9–104
unsuccessfully planted 9–104
management of 103, 104
propagated from cuttings 104
rate of growth of, in Nebraska 320
time for planting 103, 104
annual growth of (see table) 339
tried, which proved unsuccessful in Dakota 12
Illinois 22
Iowa 38
Kansas 61
Minnesota 79
Nebraska 92
number of, planted in Nebraska, statistical table 325
Tree-growth, maximum size, age, &c. Furnas 338, 342
Tree-planting and railroads 113
in the prairie States, successful and unsuccessful 9–104
cost of 321
on streets and roads 116
injuries and difficulties connected with 95–103

U.

Utah, forest condition and lumber productions of 326

W.

Washington Territory, forest condition of. Furnas 251–254
lumber productions of 254
forest condition of. Brown 388–393
transportation of logs in 391
forest fires in 392, 393
Wells, artesian 110
West Virginia, forest condition of 367–377
arbor-day in 377, 378
list of forest trees of 378–384
census statistics of 384, 385
number of saw-mills and kinds of timber sawn 386
Wisconsin, forest condition of 326–334
lumber productions of 335, 336
Wyoming, forest condition of 336, 337
Western States, forest condition of 246–337
Woodlands, decrease of, in Ohio 174
Wood trade in certain States, reports on 198–337

O